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JSC-16229

OCT 25 1979

80 - 10098

Lyndon B. Johnson Space Center
Houston Texas 77058
September 1979

NASA CR-
160473

AGRICULTURAL SOIL MOISTURE EXPERIMENT: 1978 COLBY (KANSAS

DATA CATALOG AND DOCUMENTATION

Job Order 73-156

(E80-10098) AGRICULTURAL SOIL MOISTURE EXPERIMENT: 1978 COLBY (KANSAS) DATA CATALOG AND DOCUMENTATION (Lockheed Electronics Co.) 176 p HC A09/MF A01 CSCL 02C G3/43

N80-23725

Unclas
00098

Prepared By

Lockheed Electronics Company, Inc.

Systems and Services Division

Houston, Texas

Contract NAS 9-15800

For

EARTH OBSERVATIONS DIVISION

SPACE AND LIFE SCIENCES DIRECTORATE

LEC-13226

JSC-16229

AGRICULTURAL SOIL MOISTURE EXPERIMENT: 1978 COLBY (KANSAS) DATA CATALOG AND DOCUMENTATION

Job Order 73-156

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1. INTRODUCTION

During the summer of 1978, two data acquisition activities of the Agricultural Soil Moisture Experiment (ASME) were conducted at an agricultural site near Colby, Kansas. One activity was designed to obtain data to support the testing of soil moisture point profile models; the other was designed to obtain data to support the development of algorithms for estimating surface zone soil moisture from remotely sensed data.

This document describes the above two activities and catalogs all acquired ground-truth data. Additional Colby data that will be available are discussed in appendix A.

Section 2 briefly discusses the criteria used in the selection of the test site, flight lines, and individual test fields. General information about the area is included, and maps of the specific test field locations are provided.

Section 3 discusses the data acquired for use in testing soil moisture point profile models. These data were collected from May 19 through August 30, 1978, and are referred to as "type I Data."

Section 4 discusses the data acquired to support development of algorithms for estimating surface zone soil moisture. These data were collected in conjunction with aircraft overflights between July 18 and August 11, 1978, and are referred to as "type II Data."

Some of the data subsets collected at Colby are included in this report; other subsets, which were too voluminous for inclusion, are available on magnetic tapes.[1]

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[1]To obtain any of the data listed in this report, contact J. D. Erickson, SF3, Lyndon B. Johnson Space Center, Houston, Texas 77058.

Much of the data were acquired on operating farms. This data acquisition was possible only with the extensive cooperation shown by many individuals, farm operators, and land owners in the Colby area. A list of operators of ASME test fields is given in appendix C.

2. TEST SITE DESCRIPTION

Several criteria were used for selection of a test site. The desired characteristics of a test site were as follows:

1. It should be a typical farming area with only a few crop types.
2. It must have a generally flat terrain.
3. It must be accessible to both the University of Kansas and Texas A&M University, with a consideration of characteristics and limitations of available trucks, travel time, etc.
4. If available, an operating rain gage network that could be used to measure rainfall would be desirable.
5. It should have relatively uniform soils.

A survey was conducted to locate all operating rain gage networks in the United States. Of the several potentially useful sites located, the site at Colby, Kansas, offered the following advantages:

1. It is a typical farming area with wheat, corn, sorghum, and pasture as the principal crops.
2. It consists of large areas with relatively uniform soils.
3. The terrain is relatively flat.
4. There was an operating rain gage network with 39 recording rain gages operated by the High Plains Experiment (HIPLEX) project of the U.S. Department of the Interior.
5. Additionally, three recording weather stations are operated by the Kansas Water Resources Board in the same area as the rain gages.

The boundaries of the potential test site area at Colby were defined by the rain gage network operated by HIPLEX personnel. A preliminary soils map of this area was obtained from the Soil Conservation Service of the U.S. Department of Agriculture in Colby. The test site consisted of major east-west drainage areas having a mixture of soil types. Between the drainage areas

there are relatively large areas of uniform soil types several miles long in an east-west direction and up to 4.8 kilometers (3 miles) wide in a north-south direction.

Selection of the individual flight lines and test fields was based on the following criteria.

1. Flight lines in a north-south and an east-west direction were required. Test fields for type I data should be located at the intersection of these lines.
2. Test fields for type I data should be located near a recording rain gage.
3. The crop mix for type I data should approximate the crop mix of the general area.
4. The total number of test fields for type II data should meet the minimum requirements defined in appendix D of this report.
5. All test fields should be of a relatively uniform soil type across the field.
6. Each test field should be approximately 16 hectares (40 acres) in size.

Initially, the 14 test fields for acquisition of type I data were selected on the basis of the above criteria. These fields defined flight lines 1, 2, and 3 and 5, 6, and 7. Flight line 4 was added later when personnel from the University of Kansas determined that test fields on this line met their specific requirements. Along the seven flight lines, 56 potential test fields that met the requirements for type II data were identified, including the 14 test fields used for acquisition of type I data. All fields were numbered (1 through 56), and final selection of 43 fields was made prior to the first aircraft overflight. Figure 1 shows the location of each of the 43 test fields used for data acquisition. Table 1 gives the legal description of each test field by quarter section, section, township, and range. Table 2 lists the soil type, slope, and crop for each test field. Figure 2 shows the relative timing for both data acquisition efforts. Appendix E summarizes ASME remotely sensed aircraft data collected during overflight.

TABLE 1.– TEST FIELD LEGAL DESCRIPTIONS

Field number	Legal description	Field number	Legal description
1	S Center 40 SE 28-9-33	28	SW SE 29-9-32
2	S Center 40 SE 30-9-32	29	NW NE 32-9-32
3	S Center 40 SW 28-9 32	30	NE NE 32-9-32
4	SE SE 27-9-32	31	NE NW 33-9-32
5	SW SE 26-9-32	34	SE SE 28-9-32
6	SW SE 14-8-32	37	NW NE 34-9-32
7	SW SE 25-9-32	38	NE NE 34-9-32
8	SE SE 31-8-31	39	SW SW 15-8-32
9	SE SE 18-8-31	40	S Center 40 SE 15-8-32
10	SE SE 13-8-32	43	SE SE 14-8-32
11	SE SE 18-8-32	44	SW SE 13-8-32
12	SW SE 35-8-32	45	SW SE 18-8-31
13	SE SE 31-8-32	46	NE SE 18-8-31
14	SW SW 36-8-32	47	SE SE 19-8-31
19	SW SE 26-9-33	49	NE NE 19-9-31
20	SE SE 26-9-33	50	NW NE 23-9-32
21	NW NW 36-9-33	52	SW SE 23-8-32
22	NE NW 36-9-33	53	SE SE 19-9-32
24	SW SW 29-9-32	54	S Center 40 SE 7-9-32
25	NW NW 32-9-32	55	N Center 40 NE 30-9-32
26	SE SW 29-9-32	56	SE 30 SE 30-9-31
27	NE NW 32-9-32		

TABLE 2.— SOIL TYPE AND CROP

Field no.	Soil type*	Crop†	Field no.	Soil type*	Crop†
1	B	Corn	28	A	Corn
2	C	Corn	29	B	Wheat
3	B	Corn	30	B	Wheat
4	B	Wheat	31	B	Milo
5	B	Pasture	34	C, E	Milo
6	B	Fallow	37	B, E	Corn
7	B	Wheat	38	B	Wheat
8	A	Pasture	39	A	Milo
9	B	Fallow	40	B	Corn
10	A	Wheat	43	C	Fallow
11	A	Wheat	44	A	Wheat
12	A	Fallow	45	A	Fallow
13	A	Fallow	46	B	Wheat
14	B	Pasture	47	B, F	Wheat
19	A, D	Corn	49	A	Fallow
20	A, D	Corn	50	A	Fallow
21	A, D	Corn	52	B, E	Fallow
22	A	Corn	53	A	Wheat
24	B	Milo	54	A	Fallow
25	A	Wheat	55	C	Corn
26	B	Corn	56	B	Fallow
27	C	Wheat			

*The following notations are used in this column:

A -- Keith sill loam, 0% to 1% slope.
B -- Keith sill loam, 0% to 3% slope.
C -- Keith sill loam, 1% to 3% slope.
D -- Richfield silty clay loam.
E -- Goshen silty loam.
F -- Ulysses silt loam, 1% to 3% slope (eroded).

These data were taken from an unpublished soils map provided by the USDA Soil Conservation Service in Colby.

†All corn fields were irrigated.

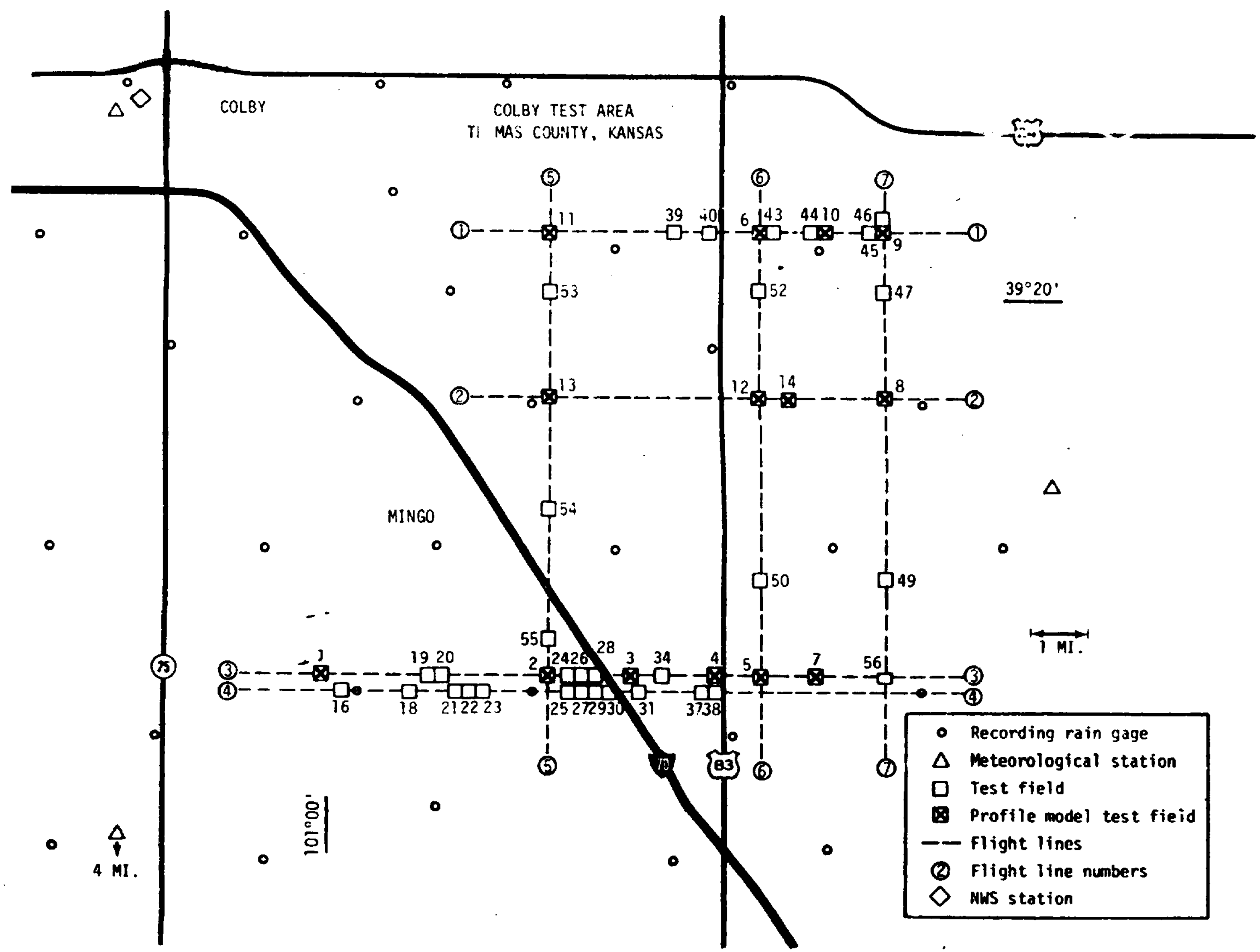


Figure 1.— Locations of the 43 test fields used for data acquisition.

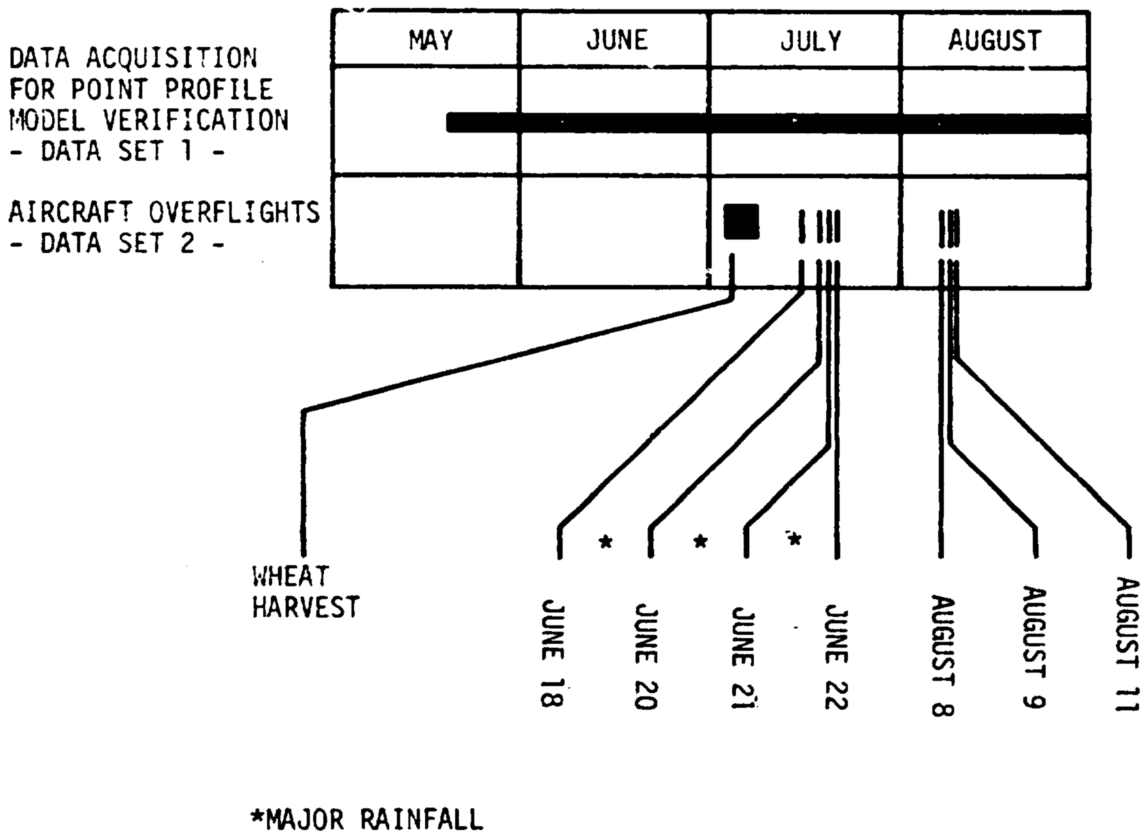


Figure 2.— Colby data acquisition schedule.

3. TYPE I DATA

The type I data were obtained to support testing of various soil moisture profile models. They were collected in fields 1 through 14 from May 19 through August 30, 1978. The type I data consist of soil moisture, bulk density, and soil hydrologic characteristics; vegetation data (leaf area index and growth stage); and weather and irrigation data.

3.1 SOIL MOISTURE DATA

Soil moisture data were collected weekly from four locations in each of the 14 test fields. Sampling locations for each field are shown in figure 3. At each location, readings were taken at depths of 0 to 7.6 centimeters (0 to 3 inches), 7.6 to 15 centimeters (3 to 6 inches), and thereafter every 15 centimeters (6 inches) down to 182.8 centimeters (72 inches).

During the initial 2 weeks, soil moisture readings for all depths were taken by gravimetrically sampling. Soil samples were taken with a coring tool at depths of 0 to 7.6 centimeters (0 to 3 inches) and 7.6 to 15 centimeters (3 to 6 inches); and a 3-centimeter sample was centered at 30.4-centimeter (12-inch) and at 15-centimeter (6-inch) intervals down to 182.8 centimeters (72 inches). The samples were placed in metal cans and returned to the laboratory. They were then weighed, dried in forced-air ovens at 120° F for 48 hours, and reweighed. The soil samples were dumped and the can and lid weighed. This weight was subtracted from the sample weight, and the gravimetric soil moisture was calculated by

$$\text{Gravimetric soil moisture} = \frac{\text{wet weight - dry weight}}{\text{dry weight}} \times 100 = \theta_g .$$

Thereafter, a neutron meter was employed to monitor the soil moisture from 6- to 72-inch depths. Gravimetric sampling of 0- to 3-inch and 3- to 6-inch layers continued through the season.

The soil moisture data are available on magnetic tape, which is nonlabeled EBCIDIC IBM format with 80-character card images blocked in 10 cards per record and with 9 tracks at 800 bits per inch (bpi). An example of the data listing is shown in table 3.

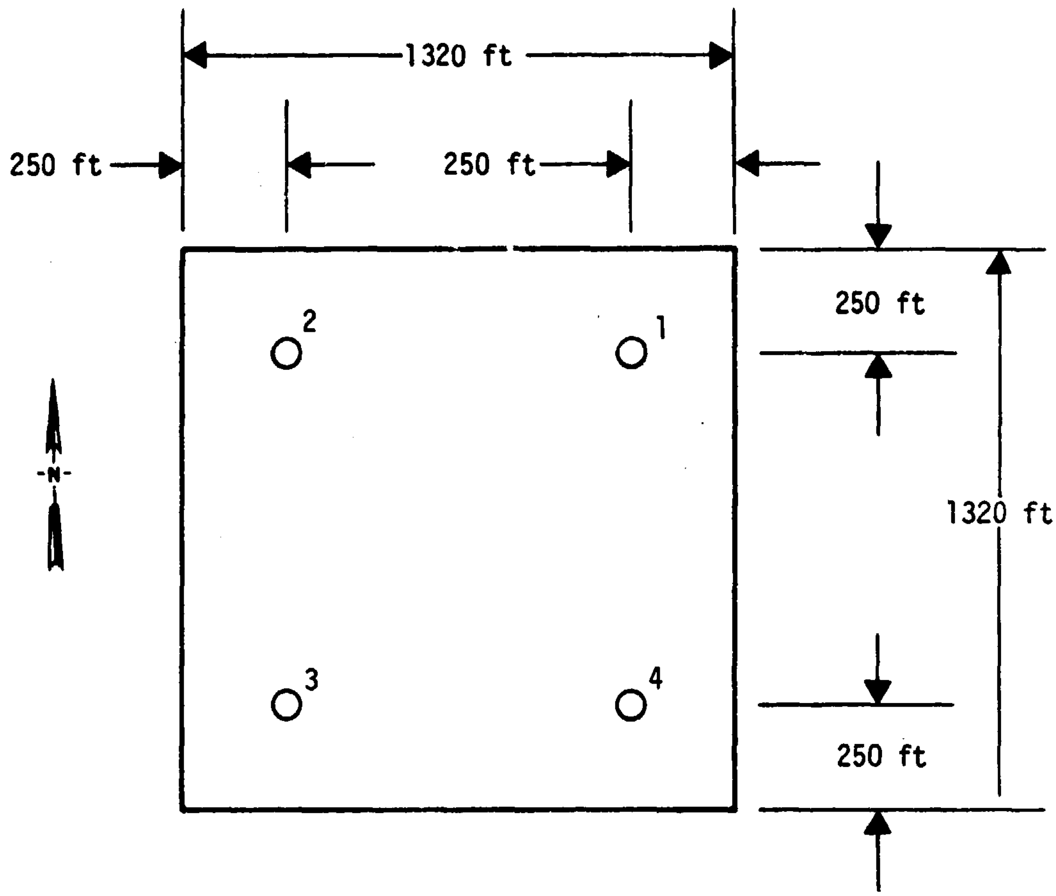
TABLE 3.– EXAMPLE OF TYPE I SOIL MOISTURE DATA

FIELD	LOCATION	JULIAN DAY	TIME[1]	VOLUMETRIC MOISTURE CONTENT, %[2] DEPTH (INCHES)														
				0-3	3-6	6	6-9[3]	12	18	24	30	36	42	48	54	60	66	72
1	1	140	1600	276	329	322	319	304	282	265	203	196	184	205	171	161	158	156
1	2	140	1600	181	333	326	328	320	301	282	280	268	263	257	260	245	215	206
1	3	140	1600	239	321	314	315	306	286	206	197	174	169	167	159	163	153	148
1	4	140	1600	266	328	321	323	316	289	271	266	226	208	195	163	157	139	133
1	1	152	930	291	332	325	325	315	340	293	262	255	275	244	175	157	139	133
1	2	152	930	282	389	380	347	284	286	199	189	181	169	176	154	160	160	148
1	3	152	930	209	394	386	391	386	348	284	276	266	254	250	254	245	209	131
1	4	152	930	300	362	354	346	323	362	314	233	235	249	238	163	157	114	150
2	1	142	1450	306	333	339	330	326	267	343	320	350	374	337	297	277	289	274
2	2	142	1450	295	310	316	325	347	389	364	309	218	208	212	210	183	124	208
2	3	142	1450	315	352	358	353	353	368	326	328	318	314	322	334	271	271	244
2	4	142	1450	152	319	325	338	366	267	250	240	262	233	234	231	292	209	218
2	1	152	1330	330	345	351	344	342	231	148	156	212	351	283	221	352	310	258
2	2	152	1330	284	301	306	304	308	379	360	334	203	244	212	210	236	162	171
2	3	152	1330	342	254	259	307	386	360	298	313	265	315	375	441	264	220	202
2	4	152	1330	325	245	249	230	206	251	268	260	223	206	227	249	166	106	162
3	1	145	930	40	161	168	185	220	239	285	290	265	248	234	149	181	144	169
3	2	145	930	102	197	205	199	202	105	50	188	212	148	220	194	227	225	200
3	3	145	930	63	188	196	211	246	192	223	97	157	158	137	140	119	105	98
3	4	145	930	150	172	179	159	139	46	253	107	57	118	80	80	97	90	198
3	1	152	0	111	204	212	220	244	118	170	104	198	171	162	144	48	50	102
3	2	152	0	202	165	172	177	197	223	257	278	265	239	231	143	172	67	162
3	3	152	0	137	161	168	191	236	208	265	48	87	151	121	133	154	102	105
3	4	152	0	242	148	154	148	148	296	292	304	363	181	124	90	98	89	86
4	1	145	800	56	37	41	60	94	80	153	107	97	102	82	75	81	65	74
4	2	145	800	54	129	143	135	146	75	96	94	90	151	146	159	131	143	136
4	3	145	800	211	235	261	234	232	201	275	260	256	270	254	265	244	258	258
4	4	145	800	150	210	233	241	288	172	253	240	223	203	214	193	200	175	171
4	1	153	900	164	155	172	200	267	210	163	157	273	193	241	220	210	193	180
4	2	153	900	152	172	191	162	146	114	235	203	144	211	167	153	178	144	105
4	3	153	900	311	270	300	235	183	239	324	289	282	300	228	241	278	236	240
4	4	153	900	264	255	283	233	201	192	270	243	272	220	239	208	231	176	190
5	1	142	1400	205	201	209	229	270	172	164	177	115	105	120	118	101	112	114
5	2	142	1400	154	220	229	248	291	156	117	104	107	118	125	115	123	111	111
5	3	142	1400	169	220	229	229	244	140	127	118	110	118	105	114	106	101	117
5	4	142	1400	220	224	233	251	293	157	134	137	132	120	120	118	134	124	123
5	1	151	0	188	153	159	165	183	190	179	183	151	175	165	151	167	165	176
5	2	151	0	248	260	270	256	251	318	273	152	156	110	161	135	186	127	185
5	3	151	0	369	219	228	217	214	235	200	160	161	141	135	155	155	130	128
5	4	151	0	122	108	112	128	158	125	81	68	64	50	82	98	112	89	69
6	1	140	1130	210	421	411	398	364	239	293	255	227	211	131	142	152	276	146
6	2	140	1130	228	310	303	301	287	279	291	228	259	267	244	246	251	246	241
6	3	140	1130	206	302	295	299	296	294	283	266	263	257	244	237	238	247	235
6	4	140	1130	243	306	299	331	370	245	272	191	188	173	174	142	190	182	165
6	1	153	1500	81	182	178	196	218	201	139	92	97	77	72	87	92	29	35
6	2	153	1500	80	66	64	113	184	158	107	97	179	86	155	81	48	142	139
6	3	153	1500	113	102	100	113	131	182	302	201	246	239	246	226	244	198	157
6	4	153	1500	110	117	114	134	160	126	82	67	65	51	86	103	133	86	75
7	1	145	1730	35	181	187	198	222	153	177	121	145	127	158	100	92	87	99
7	2	145	1730	35	161	166	184	217	152	183	114	145	125	133	100	83	89	100
7	3	145	1730	28	87	90	117	161	117	88	95	144	58	91	157	151	150	174
7	4	145	1730	15	88	91	84	78	108	120	86	132	139	148	123	126	114	113
7	1	164	1500	81	176	182	187	203	148	172	118	145	127	189	99	89	92	109
7	2	164	1500	32	86	88	94	107	150	179	109	146	125	160	99	81	88	58
7	3	164	1500	31	83	86	112	156	112	79	94	150	116	86	144	162	141	162
7	4	164	1500	44	105	109	87	59	138	138	84	131	132	155	122	124	110	89
8	1	144	1400	274	215	230	244	288	209	196	195	178	161	170	186	217	209	159
8	2	144	1400	397	282	302	301	330	290	181	178	164	174	174	171	169	156	158
8	3	144	1400	285	261	280	275	296	244	206	186	164	146	145	173	153	148	146
8	4	144	1400	295	278	299	287	301	300	200	226	214	211	202	189	158	154	137
8	1	152	930	294	254	273	266	284	249	228	195	154	178	168	248	273	288	154
8	2	152	930	322	299	321	319	348	301	177	224	217	196	220	208	194	160	202
8	3	152	930	238	263	282	262	260	277	333	219	178	189	203	242	160	125	181
8	4	152	930	215	300	322	338	395	280	166	257	247	273	181	161	153	170	136

[1]Central standard daylight time.

[2]A decimal point should be read before the last digit.

[3]Calculated average.



Soil moisture sampling depths at each location:

1. Neutron probe measurements every 15 centimeters (6 inches) from 15 to 182.8 centimeters (6 to 72 inches).
2. Gravimetric soil samples at 0 to 4.8 centimeters (0 to 3 inches) and 4.8 to 9.6 centimeters (3 to 6 inches).

Vegetation samples were acquired within 6 meters (20 feet) of the same locations.

Figure 3.— Sampling locations for type I data.

3.2 SOIL DATA

The measured soil characteristics were bulk density, saturated hydraulic conductivity, and water retention.

Samples for bulk density determination were acquired during the first 3 weeks of the sampling period. These samples were acquired in each of the 14 fields at depths of 7.6, 20, 71, and 137 centimeters (3, 8, 28, and 54 inches). Each sample was taken with a coring tool (6 centimeters in diameter) specifically designed for acquiring undisturbed soil samples for use in determining bulk density. At each of the sample depths, the soil sample was 3 centimeters deep. These samples were dried at 105° C and weighed. This sample weight, from a known volume, was used to calculate the bulk density. These results are given in table 4.

Soil samples for determining water retention were acquired at the same locations and depths as the bulk density samples. A pressure membrane apparatus was used to determine the water retention at 1/3 and 15 bars for each sample. These results are given in table 4.

Additional soil core samples were acquired for determining saturated hydraulic conductivity (table 5) and water retention at 1/3, 1, 3, 6, 10, and 15 bars (table 6). These samples were taken in fields 2, 6, 11, and 14 at depths of 20, 63.5, and 121.9 centimeters (8, 25, and 48 inches).

3.3 VEGETATION DATA

Vegetation samples were acquired twice weekly during the period of the experiment. Samples were taken at two locations in each field with green growth. These consisted of three plants for corn, 0.6 meter (2 linear feet) of wheat, and 0.092 square meter (1 square foot) of pasture. Along with these samples, the plant growth stage was recorded, using the Hanway scale for corn and the Feekes scale for wheat.

TABLE 4.— BULK-DENSITY AND WATER RETENTION CHARACTERISTICS

Field number	Soil depth, inches	Bulk density, grams per cubic centimeter	Soil moisture, percent	
			1/3 bar	15 bars
1	3	1.05	24.3	11.6
	8	1.17	25.0	12.2
	28	1.22	25.0	12.0
	54	1.09	26.1	12.7
2	3	1.26	25.1	10.8
	8	1.22	25.9	12.1
	28	1.40	26.2	11.3
	54	1.27	26.3	13.2
3	3	1.34	24.5	10.4
	8	1.22	23.6	10.7
	28	1.59	25.8	11.2
	54	1.25	26.2	11.7
4	3	1.09	25.3	11.2
	8	1.29	27.0	13.3
	28	1.43	27.7	12.7
	54	1.31	27.4	12.2
5	3	1.29	26.7	12.1
	8	1.36	25.7	12.2
	28	1.28	27.8	12.4
	54	1.31	27.8	14.4
6	3	1.07	28.1	13.8
	8	1.03	27.8	14.1
	24	1.10	27.7	14.4
	52	1.51	27.9	15.3
7	3	1.39	24.0	9.9
	8	1.25	24.6	11.8
	28	1.27	26.2	12.2
	52	1.29	25.4	11.6
8	3	0.94	25.2	11.6
	8	1.14	22.3	10.5
	26	1.51	26.5	12.4
	54	1.47	29.2	15.9
9	3	1.39	25.3	10.6
	8	1.27	23.6	11.1
	28	1.38	25.8	12.2
	52	1.34	26.2	11.5
10	3	1.14	21.6	8.9
	8	1.13	21.1	9.1
	26	1.31	23.9	10.2
	52	1.11	25.1	11.5
11	3	1.12	23.9	9.8
	8	1.13	24.7	13.3
	28	1.31	24.9	12.8
	52	1.11	25.4	12.3
12	3	1.12	27.0	10.1
	8	1.03	26.8	11.2
	28	1.47	25.9	12.0
	52	1.39	25.8	11.8
13	3	1.29	26.2	10.0
	8	1.10	25.9	12.5
	28	1.34	25.7	11.9
	52	1.23	26.2	12.1
14	3	1.06	28.0	10.7
	8	1.28	26.2	11.4
	28	1.20	26.8	11.5
	52	1.20	26.9	10.6

TABLE 5.– SATURATED HYDRAULIC CONDUCTIVITY

Field number	Soil depth, inches	Hydraulic conductivity, inches per hour					
		1 hour	2 hours	4 hours	8 hours	24 hours	48 hours
2	8	0.40	0.36	0.46	0.45	0.45	0.31
	25	1.15	0.93	1.08	1.03	1.07	1.15
	48	0.48	0.41	0.48	0.48	0.46	0.37
6	8	1.98	1.72	2.06	1.94	2.11	1.51
	25	0.26	0.22	0.26	0.26	0.29	0.33
	48	0.95	0.79	1.03	1.00	1.07	1.08
11	8	0.69	0.55	0.65	0.55	0.67	0.77
	25	0.40		0.43	0.40	0.46	0.48
	48	0.43	0.40	0.52	0.46	0.48	0.48
14	8	0.72	0.64	0.77	0.77	1.03	1.19
	25	1.38	1.20	1.46	1.43	1.44	1.62
	48	0.41	0.38	0.43			0.33

TABLE 6.– WATER RETENTION CHARACTERISTICS

Field number	Soil depth, inches	Soil moisture, percent					
		1/3 bar	1 bar	3 bars	6 bars	10 bars	15 bars
2	8	33.3	24.8	19.8	16.0	15.0	14.8
	25	32.8	23.8	18.9	16.0	15.3	14.9
	48	27.9	21.8	16.1	13.8	13.3	11.9
6	8	35.6	27.4	21.6	20.3	18.5	18.3
	25	29.8	21.7	16.4	14.2	13.9	13.4
	48	28.4	19.8	14.1	12.3	11.7	11.3
11	8	32.8	24.6	19.8	18.1	13.9	13.5
	25	32.6	23.6	18.7	15.6	15.1	14.6
	48	27.9	21.5	15.8	13.9	12.4	11.8
14	8	29.8	22.7	17.6	17.4	14.7	14.2
	25	30.9	24.5	19.3	17.0	13.5	13.4
	48	27.9	21.8	15.9	13.6	13.0	12.5

Vegetation samples were divided into stalk, stem, leaves, head, or cob and grain. The leaf area was measured with an electronic meter, and the leaf area index (LAI) was calculated by the formula:

$$LAI = \text{leaf area per plant} \times \text{plant density}.$$

The individual sections of the plant samples were weighed to determine plant dry matter for each section of the plant. The results are given in tables 7 to 16.

3.4 WEATHER AND IRRIGATION DATA

The acquired weather data consist of rainfall, air temperature, solar radiation, pan evaporation, and wind run. Irrigation information was obtained for fields 1, 2, and 3.

Rainfall data were obtained from the HIPLEX. A network of 38 recording rain gages is located throughout the test area. The locations of these gages are given in figure 4 and table 17. A sample of daily totals of rainfall is given in table 18. Fifteen-minute interval rainfall data are also available.

The National Weather Service (NWS) station at Colby acquires, on a daily basis, maximum and minimum temperatures, rainfall, solar radiation, wind run, and pan evaporation; these data are given in table 19.

Initially, it was planned to obtain data from three Climatronics recording weather stations located adjacent to the test site. These systems are operated by the Kansas Water Resources Board. Two of these stations experienced hardware failures before the start of data acquisition in May, and the units were returned to the factory for repair. They were still not operational when data acquisition ended on August 30. Data from the third Climatronics recording weather station contain several inconsistencies and missing data. This is presently being reviewed and may be available at a later date.

Irrigation information for fields 1, 2, and 3 is given in table 20 in terms of total water delivered over the time the irrigation system was in operation.

TABLE 7.– LEAF AREA INDEX AND GROWTH STAGE FOR FIELD 1

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	HANWAY SCALE	LEAF AREA INDEX
1	1	146	CORN		
1	1	150	CORN		
1	1	152	CORN	.50	.06
1	1	157	CORN	1.00	.04
1	1	160	CORN	1.00	.14
1	1	163	CORN	1.00	.14
1	1	166	CORN	1.00	.16
1	1	171	CORN	1.00	.71
1	1	173	CORN	1.50	.72
1	1	178	CORN		.76
1	1	180	CORN	1.50	.81
1	1	185	CORN	2.00	2.46
1	1	188	CORN	2.50	3.23
1	1	192	CORN	2.50	3.75
1	1	194	CORN	3.00	4.49
1	1	199	CORN	2.50	5.25
1	1	202	CORN	3.00	5.52
1	1	206	CORN	4.00	5.35
1	1	209	CORN	5.00	5.69
1	1	213	CORN	6.00	5.06
1	1	215	CORN	7.00	5.27
1	1	220	CORN	7.00	3.84
1	1	222	CORN	7.00	4.70
1	1	226	CORN	8.00	2.76
1	1	229	CORN	8.00	4.19
1	1	235	CORN	8.00	2.26
1	1	237	CORN	8.00	3.82
1	1	240	CORN	9.00	2.67
1	1	242	CORN	8.00	2.29
1	2	146	CORN		
1	2	150	CORN		
1	2	152	CORN	.50	.05
1	2	157	CORN	1.00	.06
1	2	160	CORN	1.00	.07
1	2	163	CORN	1.00	.09
1	2	166	CORN	1.00	.12
1	2	171	CORN	1.00	.74
1	2	173	CORN	1.50	.74
1	2	178	CORN		.78
1	2	180	CORN	1.50	.83
1	2	185	CORN	2.00	2.69
1	2	188	CORN	2.50	2.97
1	2	192	CORN	2.50	3.48
1	2	194	CORN	3.00	4.13
1	2	199	CORN	2.50	5.48
1	2	202	CORN	3.00	5.84
1	2	206	CORN	4.00	5.15
1	2	209	CORN	5.00	5.46
1	2	213	CORN	6.00	5.24
1	2	215	CORN	7.00	5.11
1	2	220	CORN	7.00	4.12
1	2	222	CORN	7.00	4.06
1	2	226	CORN	8.00	2.63
1	2	229	CORN	8.00	3.98
1	2	235	CORN	8.00	1.50
1	2	237	CORN	9.00	3.61
1	2	240	CORN	8.00	2.13
1	2	242	CORN	8.00	2.40
1	3	146	CORN		
1	3	150	CORN		

TABLE 7.— Concluded.

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	HANWAY SCALE	LEAF AREA INDEX
1	3	152	CORN	.50	.05
1	3	157	CORN	1.00	.05
1	3	160	CORN	1.00	.11
1	3	163	CORN	1.00	.11
1	3	166	CORN	1.00	.12
1	3	171	CORN	1.00	.76
1	3	173	CORN	1.50	.76
1	3	178	CORN		.81
1	3	180	CORN	1.50	.96
1	3	185	CORN	2.00	2.45
1	3	188	CORN	2.50	3.29
1	3	192	CORN	2.50	3.72
1	3	194	CORN	3.00	3.96
1	3	199	CORN	2.50	5.17
1	3	202	CORN	3.00	5.46
1	3	205	CORN	4.00	4.79
1	3	209	CORN	5.00	5.30
1	3	213	CORN	6.00	5.12
1	3	215	CORN	7.00	4.99
1	3	220	CORN	7.00	2.98
1	3	222	CORN	7.00	4.33
1	3	226	CORN	8.00	2.85
1	3	229	CORN	8.00	2.43
1	3	235	CORN	8.00	1.25
1	3	237	CORN	8.00	4.05
1	3	240	CORN	8.00	1.97
1	3	242	CORN	8.00	2.33
1	4	145	CORN		
1	4	150	CORN		
1	4	152	CORN	.50	.06
1	4	157	CORN	1.00	.05
1	4	160	CORN	1.00	.13
1	4	163	CORN	1.00	.14
1	4	166	CORN	1.00	.15
1	4	171	CORN	1.00	.74
1	4	173	CORN	1.50	.79
1	4	178	CORN		.85
1	4	180	CORN	1.50	.89
1	4	185	CORN	2.00	2.40
1	4	188	CORN	2.50	3.46
1	4	192	CORN	2.50	3.98
1	4	194	CORN	3.00	4.12
1	4	199	CORN	2.50	5.15
1	4	202	CORN	3.00	5.72
1	4	206	CORN	4.00	5.02
1	4	209	CORN	5.00	5.26
1	4	213	CORN	5.00	5.70
1	4	215	CORN	7.00	5.47
1	4	220	CORN	7.00	2.37
1	4	222	CORN	7.00	3.92
1	4	226	CORN	8.00	3.92
1	4	229	CORN	8.00	3.22
1	4	235	CORN	8.00	1.86
1	4	237	CORN	8.00	3.55
1	4	240	CORN	8.00	2.53
1	4	242	CORN	8.00	1.96

TABLE 8.– LEAF AREA INDEX AND GROWTH STAGE FOR FIELD 2

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	HANWAY SCALE	LEAF AREA INDEX
2	1	146	CORN		
2	1	150	CORN		
2	1	152	CORN	.50	.03
2	1	157	CORN	1.00	.04
2	1	160	CORN	1.00	.08
2	1	163	CORN	1.00	.08
2	1	166	CORN	1.00	.08
2	1	171	CORN	1.00	.47
2	1	173	CORN	1.50	.47
2	1	178	CORN		.48
2	1	180	CORN	1.50	.52
2	1	185	CORN	2.00	1.21
2	1	188	CORN	2.50	2.29
2	1	192	CORN	2.50	2.37
2	1	194	CORN	3.00	2.85
2	1	199	CORN	2.50	3.34
2	1	202	CORN	3.00	3.51
2	1	206	CORN	4.00	3.68
2	1	209	CORN	6.00	3.76
2	1	213	CORN	6.00	3.90
2	1	215	CORN	7.00	3.84
2	1	220	CORN	7.00	2.16
2	1	222	CORN	7.00	2.87
2	1	226	CORN	8.00	1.77
2	1	229	CORN	8.00	2.36
2	1	235	CORN	8.00	1.16
2	1	237	CORN	8.00	1.56
2	1	240	CORN	8.00	1.88
2	1	242	CORN	8.00	1.98
2	2	146	CORN		
2	2	150	CORN		
2	2	152	CORN	.50	.03
2	2	157	CORN	1.00	.05
2	2	160	CORN	1.00	.04
2	2	163	CORN	1.00	.06
2	2	166	CORN	1.00	.07
2	2	171	CORN	1.00	.48
2	2	173	CORN	1.50	.49
2	2	178	CORN		.53
2	2	180	CORN	1.50	.54
2	2	185	CORN	2.00	1.79
2	2	188	CORN	2.50	2.18
2	2	192	CORN	2.50	2.27
2	2	194	CORN	3.00	2.75
2	2	199	CORN	2.50	3.14
2	2	202	CORN	3.00	3.62
2	2	206	CORN	4.00	3.53
2	2	209	CORN	6.00	3.64
2	2	213	CORN	6.00	3.90
2	2	215	CORN	7.00	3.90
2	2	220	CORN	7.00	1.98
2	2	222	CORN	7.00	3.45
2	2	226	CORN	8.00	1.59
2	2	229	CORN	8.00	1.42
2	2	235	CORN	8.00	1.40
2	2	237	CORN	8.00	1.19
2	2	240	CORN	8.00	1.17
2	2	242	CORN	8.00	1.11
2	3	146	CORN		

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TABLE 8.– Concluded.

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	HANWAY SCALE	LEAF AREA INDEX
2	3	150	CORN		
2	3	152	CORN	.50	.03
2	3	157	CORN	1.00	.03
2	3	160	CORN	1.00	.07
2	3	163	CORN	1.00	.07
2	3	166	CORN	1.00	.08
2	3	171	CORN	1.00	.46
2	3	173	CORN	1.50	.47
2	3	178	CORN		.50
2	3	180	CORN	1.50	.53
2	3	185	CORN	2.00	1.70
2	3	188	CORN	2.50	2.29
2	3	192	CORN	2.50	2.27
2	3	194	CORN	3.00	2.51
2	3	199	CORN	2.50	3.62
2	3	202	CORN	3.00	3.71
2	3	206	CORN	4.00	3.54
2	3	209	CORN	5.00	3.60
2	3	213	CORN	6.00	3.68
2	3	215	CORN	7.00	3.70
2	3	220	CORN	7.00	1.74
2	3	222	CORN	7.00	3.13
2	3	226	CORN	8.00	2.29
2	3	229	CORN	8.00	2.21
2	3	235	CORN	8.00	.53
2	3	237	CORN	8.00	.41
2	3	241	CORN	8.00	2.53
2	3	242	CORN	8.00	1.33
2	4	145	CORN		
2	4	150	CORN		
2	4	152	CORN	.50	.03
2	4	157	CORN	1.00	.03
2	4	160	CORN	1.00	.09
2	4	163	CORN	1.00	.10
2	4	166	CORN	1.00	.10
2	4	171	CORN	1.00	.47
2	4	173	CORN	1.50	.50
2	4	178	CORN		.53
2	4	180	CORN	1.50	.55
2	4	185	CORN	2.00	1.71
2	4	188	CORN	2.50	2.29
2	4	192	CORN	2.50	2.36
2	4	194	CORN	3.00	2.67
2	4	199	CORN	2.50	3.40
2	4	202	CORN	3.00	3.32
2	4	206	CORN	4.00	3.44
2	4	209	CORN	5.00	3.95
2	4	213	CORN	6.00	3.84
2	4	215	CORN	7.00	3.56
2	4	220	CORN	7.00	2.34
2	4	222	CORN	7.00	3.30
2	4	226	CORN	8.00	2.31
2	4	229	CORN	8.00	1.23
2	4	235	CORN	8.00	.32
2	4	237	CORN	8.00	.79
2	4	241	CORN	8.00	1.89
2	4	242	CORN	8.00	1.44

TABLE 9.– LEAF AREA INDEX AND GROWTH STAGE FOR FIELD 3

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	HANWAY SCALE	LEAF AREA INDEX
3	1	146	CORN		
3	1	150	CORN		
3	1	152	CORN		.01
3	1	157	CORN	.50	.01
3	1	160	CORN	.50	.07
3	1	163	CORN	.50	.07
3	1	166	CORN	.50	.04
3	1	171	CORN	.50	.17
3	1	173	CORN	1.00	.18
3	1	178	CORN		.19
3	1	180	CORN	1.00	.20
3	1	185	CORN	1.50	.61
3	1	188	CORN	2.00	1.07
3	1	192	CORN	2.00	1.20
3	1	194	CORN	2.50	1.53
3	1	199	CORN	2.00	2.84
3	1	202	CORN	2.50	3.16
3	1	206	CORN	3.00	3.22
3	1	209	CORN	3.50	3.30
3	1	213	CORN	4.00	2.74
3	1	215	CORN	5.00	2.91
3	1	220	CORN	6.00	2.41
3	1	222	CORN	6.00	3.18
3	1	225	CORN	6.00	1.68
3	1	229	CORN	6.00	2.46
3	1	235	CORN	6.00	1.55
3	1	237	CORN	5.00	3.44
3	1	240	CORN	7.00	1.68
3	1	242	CORN	7.00	1.90
3	2	146	CORN		
3	2	150	CORN		
3	2	152	CORN		
3	2	157	CORN	.50	.02
3	2	160	CORN	.50	.07
3	2	163	CORN	.50	.07
3	2	166	CORN	.50	.05
3	2	171	CORN	.50	.18
3	2	173	CORN	1.00	.17
3	2	178	CORN		.19
3	2	180	CORN	1.00	.20
3	2	185	CORN	1.50	.63
3	2	188	CORN	2.00	1.10
3	2	192	CORN	2.00	1.22
3	2	194	CORN	2.50	1.64
3	2	199	CORN	2.00	2.64
3	2	202	CORN	2.50	2.91
3	2	206	CORN	3.00	3.26
3	2	209	CORN	3.50	3.05
3	2	213	CORN	4.00	3.10
3	2	215	CORN	5.00	3.08
3	2	220	CORN	6.00	1.33
3	2	222	CORN	6.00	3.37
3	2	225	CORN	6.00	3.08
3	2	229	CORN	6.00	2.64
3	2	235	CORN	6.00	2.45
3	2	237	CORN	6.00	2.97
3	2	240	CORN	6.00	1.83
3	2	242	CORN	6.00	2.00
3	3	146	CORN		

TABLE 9.— Concluded.

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	HANWAY SCALE	LEAF AREA INDEX
3	3	150	CORN		
3	3	152	CORN		.01
3	3	157	CORN	.50	.01
3	3	160	CORN	.50	.12
3	3	163	CORN	.50	.02
3	3	166	CORN	.50	.05
3	3	171	CORN	.50	.17
3	3	173	CORN	1.00	.17
3	3	176	CORN		.18
3	3	180	CORN	1.00	.19
3	3	183	CORN	1.50	.65
3	3	188	CORN	2.00	1.01
3	3	192	CORN	2.00	1.26
3	3	194	CORN	2.50	1.70
3	3	199	CORN	2.00	2.76
3	3	202	CORN	2.50	2.84
3	3	206	CORN	3.00	3.00
3	3	209	CORN	3.50	3.24
3	3	213	CORN	4.00	2.90
3	3	215	CORN	5.00	3.02
3	3	220	CORN	6.00	2.07
3	3	222	CORN	6.00	3.20
3	3	225	CORN	6.00	2.29
3	3	229	CORN	6.00	2.41
3	3	235	CORN	6.00	2.66
3	3	237	CORN	6.00	2.73
3	3	240	CORN	7.00	2.21
3	3	242	CORN	7.00	2.40
3	4	146	CORN		
3	4	150	CORN		
3	4	152	CORN		.01
3	4	157	CORN	.50	.01
3	4	160	CORN	.50	.08
3	4	163	CORN	.50	.01
3	4	166	CORN	.50	.04
3	4	171	CORN	.50	.18
3	4	173	CORN	1.00	.18
3	4	178	CORN		.19
3	4	180	CORN	1.00	.21
3	4	185	CORN	1.50	.61
3	4	188	CORN	2.00	1.06
3	4	192	CORN	2.00	1.23
3	4	194	CORN	2.50	1.61
3	4	199	CORN	2.00	2.01
3	4	202	CORN	2.50	3.16
3	4	206	CORN	3.00	3.24
3	4	209	CORN	3.50	3.39
3	4	213	CORN	4.00	2.73
3	4	215	CORN	5.00	2.83
3	4	220	CORN	6.00	2.79
3	4	222	CORN	6.00	3.05
3	4	225	CORN	6.00	3.24
3	4	229	CORN	6.00	2.07
3	4	235	CORN	6.00	2.43
3	4	237	CORN	6.00	2.52
3	4	240	CORN	7.00	1.56
3	4	242	CORN	7.00	1.85

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TABLE 10.— LEAF AREA INDEX FOR FIELD 5

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	LEAF AREA INDEX
5	1	146	PASTURE	.76
5	1	150	PASTURE	.68
5	1	152	PASTURE	.54
5	1	157	PASTURE	.80
5	1	160	PASTURE	.53
5	1	163	PASTURE	.55
5	1	166	PASTURE	.53
5	1	171	PASTURE	.51
5	1	173	PASTURE	.51
5	1	178	PASTURE	.54
5	1	180	PASTURE	.56
5	1	185	PASTURE	.69
5	1	188	PASTURE	.69
5	1	192	PASTURE	.74
5	1	194	PASTURE	.41
5	1	199	PASTURE	
5	1	202	PASTURE	
5	1	205	PASTURE	.09
5	1	209	PASTURE	.11
5	1	213	PASTURE	.11
5	1	215	PASTURE	.09
5	1	220	PASTURE	.14
5	1	222	PASTURE	.05
5	1	226	PASTURE	
5	1	229	PASTURE	
5	1	235	PASTURE	
5	1	237	PASTURE	
5	1	240	PASTURE	
5	1	242	PASTURE	
5	2	146	PASTURE	.68
5	2	150	PASTURE	.68
5	2	152	PASTURE	.52
5	2	157	PASTURE	.85
5	2	160	PASTURE	.49
5	2	163	PASTURE	.59
5	2	165	PASTURE	.60
5	2	171	PASTURE	.64
5	2	173	PASTURE	.65
5	2	178	PASTURE	.67
5	2	180	PASTURE	.66
5	2	185	PASTURE	.68
5	2	188	PASTURE	.66
5	2	192	PASTURE	.71
5	2	194	PASTURE	.29
5	2	199	PASTURE	
5	2	202	PASTURE	
5	2	206	PASTURE	.07
5	2	209	PASTURE	.09
5	2	213	PASTURE	.10
5	2	215	PASTURE	.10
5	2	220	PASTURE	.51
5	2	222	PASTURE	.04
5	2	226	PASTURE	
5	2	229	PASTURE	
5	2	235	PASTURE	
5	2	237	PASTURE	
5	2	240	PASTURE	
5	2	242	PASTURE	
5	3	146	PASTURE	.69

TABLE 10.— Concluded.

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	LEAF AREA INDEX
5	3	150	PASTURE	.77
5	3	152	PASTURE	.51
5	3	157	PASTURE	.73
5	3	160	PASTURE	.54
5	3	163	PASTURE	.69
5	3	166	PASTURE	.56
5	3	173	PASTURE	.45
5	3	178	PASTURE	.57
5	3	180	PASTURE	.61
5	3	185	PASTURE	.67
5	3	188	PASTURE	.64
5	3	192	PASTURE	.64
5	3	194	PASTURE	.23
5	3	199	PASTURE	
5	3	202	PASTURE	
5	3	206	PASTURE	.04
5	3	209	PASTURE	.11
5	3	213	PASTURE	.11
5	3	215	PASTURE	.11
5	3	220	PASTURE	.20
5	3	222	PASTURE	.02
5	3	226	PASTURE	
5	3	229	PASTURE	
5	3	235	PASTURE	
5	3	237	PASTURE	
5	3	240	PASTURE	
5	3	242	PASTURE	
5	4	146	PASTURE	.67
5	4	150	PASTURE	.90
5	4	152	PASTURE	.25
5	4	157	PASTURE	.58
5	4	160	PASTURE	.65
5	4	163	PASTURE	.44
5	4	165	PASTURE	.43
5	4	171	PASTURE	.54
5	4	173	PASTURE	.52
5	4	178	PASTURE	.55
5	4	180	PASTURE	.61
5	4	185	PASTURE	.63
5	4	188	PASTURE	.67
5	4	192	PASTURE	.63
5	4	194	PASTURE	.24
5	4	199	PASTURE	
5	4	202	PASTURE	
5	4	206	PASTURE	.09
5	4	209	PASTURE	.09
5	4	213	PASTURE	.09
5	4	215	PASTURE	.10
5	4	220	PASTURE	.24
5	4	222	PASTURE	.05
5	4	226	PASTURE	
5	4	229	PASTURE	
5	4	235	PASTURE	
5	4	237	PASTURE	
5	4	240	PASTURE	
5	4	242	PASTURE	

TABLE 11.— LEAF AREA INDEX FOR FIELD 8

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	LEAF AREA INDEX
8	1	146	PASTURE	.30
8	1	150	PASTURE	.30
8	1	152	PASTURE	.31
8	1	152	PASTURE	.52
8	1	157	PASTURE	.52
8	1	160		.23
8	1	163	PASTURE	.45
8	1	166	PASTURE	.27
8	1	171	PASTURE	.31
8	1	173	PASTURE	.32
8	1	178	PASTURE	.33
8	1	180	PASTURE	.34
8	1	185	PASTURE	.43
8	1	188	PASTURE	.43
8	1	192	PASTURE	.52
8	1	194	PASTURE	.29
8	1	199	PASTURE	.06
8	1	202	PASTURE	
8	1	206	PASTURE	.03
8	1	209	PASTURE	.07
8	1	213	PASTURE	.10
8	1	215	PASTURE	.10
8	1	220	PASTURE	.10
8	1	222	PASTURE	.08
8	1	226	PASTURE	
8	1	229	PASTURE	
8	1	235	PASTURE	
8	1	237	PASTURE	
8	1	240	PASTURE	
8	1	242	PASTURE	
8	2	146	PASTURE	.39
8	2	150	PASTURE	.51
8	2	152	PASTURE	.26
8	2	157	PASTURE	.42
8	2	160		.32
8	2	163	PASTURE	.34
8	2	166	PASTURE	.33
8	2	171	PASTURE	.33
8	2	173	PASTURE	.33
8	2	178	PASTURE	.35
8	2	180	PASTURE	.45
8	2	185	PASTURE	.41
8	2	188	PASTURE	.49
8	2	192	PASTURE	.45
8	2	194	PASTURE	.21
8	2	199	PASTURE	.08
8	2	204	PASTURE	.11
8	2	213	PASTURE	.01
8	2	215	PASTURE	.10
8	2	220	PASTURE	.16
8	2	222	PASTURE	.14
8	2	226	PASTURE	
8	2	229	PASTURE	
8	2	235	PASTURE	
8	2	237	PASTURE	
8	2	240	PASTURE	
8	2	242	PASTURE	
8	3	146	PASTURE	.38
8	3	150	PASTURE	.43

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TABLE 11.— Concluded.

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	LEAF AREA INDEX
8	3	152	PASTURE	.38
8	3	157	PASTURE	.44
8	3	160		.38
8	3	163	PASTURE	.32
8	3	166	PASTURE	.41
8	3	171	PASTURE	.44
8	3	173	PASTURE	.49
8	3	178	PASTURE	.47
8	3	180	PASTURE	.50
8	3	185	PASTURE	.44
8	3	188	PASTURE	.42
8	3	192	PASTURE	.53
8	3	194	PASTURE	.24
8	3	199	PASTURE	.05
8	3	202	PASTURE	
8	3	205	PASTURE	.04
8	3	209	PASTURE	.06
8	3	213	PASTURE	.07
8	3	215	PASTURE	.07
8	3	220	PASTURE	.22
8	3	222	PASTURE	
8	3	226	PASTURE	
8	3	229	PASTURE	
8	3	235	PASTURE	
8	3	237	PASTURE	
8	3	240	PASTURE	
8	3	242	PASTURE	
8	4	146	PASTURE	.58
8	4	150	PASTURE	.70
8	4	157	PASTURE	.50
8	4	160		.46
8	4	163	PASTURE	.42
8	4	166	PASTURE	.45
8	4	171	PASTURE	.45
8	4	173	PASTURE	.47
8	4	178	PASTURE	.46
8	4	180	PASTURE	.52
8	4	185	PASTURE	.45
8	4	188	PASTURE	.46
8	4	192	PASTURE	.55
8	4	194	PASTURE	.22
8	4	199	PASTURE	.04
8	4	202	PASTURE	
8	4	206	PASTURE	.06
8	4	209	PASTURE	.08
8	4	213	PASTURE	.10
8	4	215	PASTURE	.09
8	4	220	PASTURE	.20
8	4	222	PASTURE	.04
8	4	226	PASTURE	
8	4	229	PASTURE	
8	4	235	PASTURE	
8	4	237	PASTURE	
8	4	240	PASTURE	
8	4	242	PASTURE	

TABLE 12.— LEAF AREA INDEX FOR FIELD 14

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	LEAF AREA INDEX
14	1	146	PASTURE	.67
14	1	150	PASTURE	.49
14	1	152	PASTURE	.47
14	1	157	PASTURE	.68
14	1	163	PASTURE	.45
14	1	166	PASTURE	.52
14	1	171	PASTURE	.54
14	1	173	PASTURE	.62
14	1	178	PASTURE	.63
14	1	180	PASTURE	.65
14	1	185	PASTURE	.63
14	1	188	PASTURE	.64
14	1	192	PASTURE	.65
14	1	194	PASTURE	.41
14	1	199	PASTURE	.08
14	1	202	PASTURE	
14	1	206	PASTURE	.07
14	1	209	PASTURE	.08
14	1	213	PASTURE	.11
14	1	215	PASTURE	.11
14	1	220	PASTURE	.30
14	1	222	PASTURE	.08
14	1	226	PASTURE	
14	1	229	PASTURE	
14	1	235	PASTURE	
14	1	237	PASTURE	
14	1	240	PASTURE	
14	1	242	PASTURE	
14	2	146	PASTURE	.56
14	2	150	PASTURE	.36
14	2	152	PASTURE	.38
14	2	157	PASTURE	.62
14	2	160		.59
14	2	163	PASTURE	.63
14	2	166	PASTURE	.56
14	2	171	PASTURE	.57
14	2	173	PASTURE	.65
14	2	178	PASTURE	.67
14	2	180	PASTURE	.67
14	2	185	PASTURE	.70
14	2	188	PASTURE	.67
14	2	192	PASTURE	.66
14	2	194	PASTURE	.42
14	2	199	PASTURE	.08
14	2	202	PASTURE	
14	2	206	PASTURE	.07
14	2	209	PASTURE	.09
14	2	213	PASTURE	.10
14	2	215	PASTURE	.12
14	2	220	PASTURE	.11
14	2	222	PASTURE	.07
14	2	226	PASTURE	
14	2	229	PASTURE	
14	2	235	PASTURE	
14	2	237	PASTURE	
14	2	240	PASTURE	
14	2	242	PASTURE	
14	3	146	PASTURE	.26
14	3	150	PASTURE	.67

TABLE 12.— Concluded.

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	LEAF AREA INDEX
14	3	152	PASTURE	.70
14	3	157	PASTURE	.92
14	3	160		.54
14	3	163	PASTURE	.53
14	3	166	PASTURE	.58
14	3	171	PASTURE	.06
14	3	173	PASTURE	.61
14	3	178	PASTURE	.65
14	3	180	PASTURE	.63
14	3	185	PASTURE	.68
14	3	188	PASTURE	.70
14	3	192	PASTURE	.69
14	3	194	PASTURE	.43
14	3	199	PASTURE	.06
14	3	202	PASTURE	
14	3	206	PASTURE	.03
14	3	209	PASTURE	.06
14	3	213	PASTURE	.09
14	3	215	PASTURE	.11
14	3	220	PASTURE	.15
14	3	222	PASTURE	.08
14	3	226	PASTURE	
14	3	229	PASTURE	
14	3	235	PASTURE	
14	3	237	PASTURE	
14	3	240	PASTURE	
14	3	242	PASTURE	
14	4	146	PASTURE	.40
14	4	150	PASTURE	.23
14	4	152	PASTURE	.34
14	4	157	PASTURE	.56
14	4	160		.90
14	4	163	PASTURE	.70
14	4	166	PASTURE	.75
14	4	171	PASTURE	.64
14	4	173	PASTURE	.77
14	4	178	PASTURE	.85
14	4	180	PASTURE	.86
14	4	185	PASTURE	.81
14	4	188	PASTURE	.86
14	4	192	PASTURE	.76
14	4	194	PASTURE	.48
14	4	199	PASTURE	.06
14	4	202	PASTURE	
14	4	206	PASTURE	.03
14	4	209	PASTURE	.05
14	4	213	PASTURE	.09
14	4	215	PASTURE	.09
14	4	220	PASTURE	.27
14	4	222	PASTURE	.03
14	4	226	PASTURE	
14	4	229	PASTURE	
14	4	235	PASTURE	
14	4	237	PASTURE	
14	4	240	PASTURE	
14	4	242	PASTURE	

TABLE 13.— LEAF AREA INDEX AND GROWTH STAGE FOR FIELD 4

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	FEEKES SCALE	LEAF AREA INDEX
4	1	146	WHEAT	10.50	.57
4	1	150	WHEAT	10.50	.67
4	1	152	WHEAT	10.53	1.02
4	1	157	WHEAT	10.54	.94
4	1	160	WHEAT	10.54	.34
4	1	163	WHEAT	11.20	.32
4	1	166	WHEAT	11.20	.13
4	1	171	WHEAT	11.30	.01
4	1	173	WHEAT	11.30	
4	1	178	WHEAT	11.30	
4	1	180	WHEAT	11.30	
4	1	185	WHEAT	11.50	
4	1	188	WHEAT	11.50	
4	1	192	WHEAT H		
4	1	194	WHEAT H		
4	1	199	WHEAT H		
4	1	202	WHEAT H		
4	2	146	WHEAT	10.50	.65
4	2	150	WHEAT	10.50	.55
4	2	152	WHEAT	10.53	.60
4	2	157	WHEAT	10.54	.96
4	2	160	WHEAT	10.54	.35
4	2	163	WHEAT	11.20	.32
4	2	166	WHEAT	11.20	.14
4	2	171	WHEAT	11.30	.01
4	2	173	WHEAT	11.30	
4	2	178	WHEAT	11.30	
4	2	180	WHEAT	11.30	
4	2	185	WHEAT	11.50	
4	2	188	WHEAT	11.50	
4	2	192	WHEAT H		
4	2	194	WHEAT H		
4	2	199	WHEAT H		
4	2	202	WHEAT H		
4	3	146	WHEAT	10.50	.61
4	3	150	WHEAT	10.50	.56
4	3	152	WHEAT	10.53	.75
4	3	157	WHEAT	10.54	.94
4	3	160	WHEAT	10.54	.37
4	3	163	WHEAT	11.20	.35
4	3	166	WHEAT	11.20	.14
4	3	171	WHEAT	11.30	.01
4	3	173	WHEAT	11.30	
4	3	178	WHEAT	11.30	
4	3	180	WHEAT	11.30	
4	3	185	WHEAT	11.50	
4	3	188	WHEAT	11.50	
4	3	192	WHEAT H		
4	3	194	WHEAT H		
4	3	199	WHEAT H		
4	3	202	WHEAT H		
4	4	146	WHEAT	10.50	.54
4	4	150	WHEAT	10.50	.61
4	4	152	WHEAT	10.53	1.26
4	4	157	WHEAT	10.54	.98
4	4	160	WHEAT	10.54	.33
4	4	163	WHEAT	11.20	.32
4	4	166	WHEAT	11.20	.15
4	4	171	WHEAT	11.30	.01

TABLE 13.— Concluded.

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	FEEKES SCALE	LEAF AREA INDEX
4	4	173	WHEAT	11.30	
4	4	178	WHEAT	11.30	
4	4	180	WHEAT	11.30	
4	4	185	WHEAT	11.50	
4	4	188	WHEAT	11.50	
4	4	192	WHEAT H		
4	4	194	WHEAT H		
4	4	199	WHEAT H		
4	4	202	WHEAT H		

TABLE 14.— LEAF AREA INDEX AND GROWTH STAGE FOR FIELD 7

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	FEEKES SCALE	LEAF AREA INDEX
7	1	146	WHEAT	10.50	.54
7	1	150	WHEAT	10.50	.82
7	1	152	WHEAT	10.53	.41
7	1	157	WHEAT	10.54	.96
7	1	160		10.54	.25
7	1	163	WHEAT	11.20	.24
7	1	166	WHEAT	11.20	.25
7	1	171	WHEAT	11.30	.01
7	1	173	WHEAT	11.30	
7	1	178	WHEAT	11.30	
7	1	180	WHEAT	11.30	
7	1	185	WHEAT	11.50	
7	1	188	WHEAT	11.50	
7	1	192	WHEAT H		
7	1	194	WHEAT H		
7	1	199	WHEAT H		
7	1	202	WHEAT H		
7	2	146	WHEAT	10.50	.52
7	2	150	WHEAT	10.50	.87
7	2	152	WHEAT	10.53	.43
7	2	157	WHEAT	10.54	1.01
7	2	160		10.54	.28
7	2	163	WHEAT	11.20	.26
7	2	166	WHEAT	11.20	.26
7	2	171	WHEAT	11.30	.01
7	2	173	WHEAT	11.30	
7	2	178	WHEAT	11.30	
7	2	180	WHEAT	11.30	
7	2	185	WHEAT	11.50	
7	2	188	WHEAT	11.50	
7	2	192	WHEAT H		
7	2	194	WHEAT H		
7	2	199	WHEAT H		
7	2	202	WHEAT H		
7	3	146	WHEAT	10.50	.55
7	3	150	WHEAT	10.50	.83
7	3	152	WHEAT	10.53	.40
7	3	157	WHEAT	10.54	.80
7	3	160		10.54	.22
7	3	163	WHEAT	11.20	.17
7	3	166	WHEAT	11.20	.17
7	3	171	WHEAT	11.30	.01
7	3	173	WHEAT	11.30	
7	3	178	WHEAT	11.30	
7	3	180	WHEAT	11.30	
7	3	185	WHEAT	11.50	
7	3	188	WHEAT	11.50	
7	3	192	WHEAT H		
7	3	194	WHEAT H		
7	3	199	WHEAT H		
7	3	202	WHEAT H		
7	4	146	WHEAT	10.50	.59
7	4	150	WHEAT	10.50	.85
7	4	152	WHEAT	10.53	.44
7	4	157	WHEAT	10.54	.88
7	4	160		10.54	.24
7	4	163	WHEAT	11.20	.23
7	4	166	WHEAT	11.20	.23
7	4	171	WHEAT	11.30	.01

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TABLE 14.– Concluded.

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	FEEKES SCALE	LEAF AREA INDEX
7	4	173	WHEAT	11.30	
7	4	178	WHEAT	11.30	
7	4	180	WHEAT	11.30	
7	4	185	WHEAT	11.50	
7	4	188	WHEAT	11.50	
7	4	192	WHEAT H		
7	4	194	WHEAT H		
7	4	199	WHEAT H		
7	4	202	WHEAT H		

TABLE 15.— LEAF AREA INDEX AND GROWTH STAGE FOR FIELD 10

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	FEEKES SCALE	LEAF AREA INDEX
10	1	146	WHEAT	10.50	.78
10	1	150	WHEAT	10.50	.85
10	1	152	WHEAT	10.53	.56
10	1	157	WHEAT	10.54	.90
10	1	160		11.10	.61
10	1	163	WHEAT	11.10	.60
10	1	166	WHEAT	11.10	.23
10	1	171	WHEAT	11.30	.01
10	1	173	WHEAT	11.30	
10	1	178	WHEAT	11.30	
10	1	180	WHEAT	11.30	
10	1	185	WHEAT	11.50	
10	1	188	WHEAT	11.50	
10	1	192	WHEAT H		
10	1	194	WHEAT H		
10	1	199	WHEAT H		
10	1	202	WHEAT H		
10	2	146	WHEAT	10.50	.91
10	2	150	WHEAT	10.50	.93
10	2	152	WHEAT	10.53	.60
10	2	157	WHEAT	10.54	.94
10	2	160		11.10	.72
10	2	163	WHEAT	11.10	.59
10	2	166	WHEAT	11.10	.27
10	2	171	WHEAT	11.30	.01
10	2	173	WHEAT	11.30	
10	2	178	WHEAT	11.30	
10	2	180	WHEAT	11.30	
10	2	185	WHEAT	11.50	
10	2	188	WHEAT	11.50	
10	2	192	WHEAT H		
10	2	194	WHEAT H		
10	2	199	WHEAT H		
10	2	202	WHEAT H		
10	3	146	WHEAT	10.50	.94
10	3	150	WHEAT	10.50	.94
10	3	152	WHEAT	10.53	.61
10	3	157	WHEAT	10.54	.97
10	3	160		11.10	.67
10	3	163	WHEAT	11.10	.67
10	3	166	WHEAT	11.10	.25
10	3	171	WHEAT	11.30	.01
10	3	173	WHEAT	11.30	
10	3	178	WHEAT	11.30	
10	3	180	WHEAT	11.30	
10	3	185	WHEAT	11.50	
10	3	188	WHEAT	11.50	
10	3	192	WHEAT H		
10	3	194	WHEAT H		
10	3	199	WHEAT H		
10	3	202	WHEAT H		
10	4	146	WHEAT	10.50	1.00
10	4	150	WHEAT	10.50	.95
10	4	152	WHEAT	10.53	.74
10	4	157	WHEAT	10.54	.93
10	4	160		11.10	.62
10	4	163	WHEAT	11.10	.61
10	4	166	WHEAT	11.10	.31
10	4	171	WHEAT	11.30	.01

TABLE 15.-- Concluded.

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	FEEKES SCALE	LEAF AREA INDEX
10	4	173	WHEAT	11.30	
10	4	176	WHEAT	11.30	
10	4	180	WHEAT	11.30	
10	4	185	WHEAT	11.50	
10	4	188	WHEAT	11.50	
10	4	192	WHEAT H		
10	4	194	WHEAT H		
10	4	199	WHEAT H		
10	4	202	WHEAT H		

TABLE 16.—LEAF AREA INDEX AND GROWTH STAGE FOR FIELD 11

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	FEEKES SCALE	LEAF AREA INDEX
11	1	146	WHEAT	10.50	.41
11	1	150	WHEAT	10.50	.50
11	1	152	WHEAT	10.53	.40
11	1	157	WHEAT	10.54	.34
11	1	160		11.10	.13
11	1	163	WHEAT	11.20	.15
11	1	165	WHEAT	11.20	.13
11	1	171	WHEAT	11.30	.02
11	1	173	WHEAT	11.30	
11	1	178	WHEAT	11.30	
11	1	180	WHEAT	11.30	
11	1	185	WHEAT	11.50	
11	1	188	WHEAT	11.50	
11	1	192	WHEAT H		
11	1	194	WHEAT H		
11	1	199	WHEAT H		
11	1	202	WHEAT H		
11	2	146	WHEAT	10.50	.51
11	2	150	WHEAT	10.50	.56
11	2	152	WHEAT	10.53	.33
11	2	157	WHEAT	10.54	.32
11	2	160		11.10	.17
11	2	163	WHEAT	11.20	.17
11	2	165	WHEAT	11.20	.16
11	2	171	WHEAT	11.30	.02
11	2	173	WHEAT	11.30	
11	2	178	WHEAT	11.30	
11	2	180	WHEAT	11.30	
11	2	185	WHEAT	11.50	
11	2	188	WHEAT	11.50	
11	2	192	WHEAT H		
11	2	194	WHEAT H		
11	2	199	WHEAT H		
11	2	202	WHEAT H		
11	3	146	WHEAT	10.50	.50
11	3	150	WHEAT	10.50	.64
11	3	152	WHEAT	10.53	.33
11	3	157	WHEAT	10.54	.35
11	3	160		11.10	.16
11	3	163	WHEAT	11.20	.16
11	3	165	WHEAT	11.20	.16
11	3	171	WHEAT	11.30	.03
11	3	173	WHEAT	11.30	
11	3	178	WHEAT	11.30	
11	3	180	WHEAT	11.30	
11	3	185	WHEAT	11.50	
11	3	188	WHEAT	11.50	
11	3	192	WHEAT H		
11	3	194	WHEAT H		
11	3	199	WHEAT H		
11	3	202	WHEAT H		
11	4	146	WHEAT	10.50	.29
11	4	150	WHEAT	10.50	.63
11	4	152	WHEAT	10.53	.34
11	4	157	WHEAT	10.54	.32
11	4	160		11.10	.16
11	4	163	WHEAT	11.20	.15
11	4	165	WHEAT	11.20	.15
11	4	171	WHEAT	11.30	.03

TABLE 16.— Concluded.

FIELD NUMBER	SAMPLE LOCATION	JULIAN DAY	CROP	FEEKES SCALE	LEAF AREA INDEX
11	4	173	WHEAT	11.30	
11	4	178	WHEAT	11.30	
11	4	180	WHEAT	11.30	
11	4	185	WHEAT	11.50	
11	4	188	WHEAT	11.50	
[illegible]	4	192	WHEAT H		
[illegible]	4	194	WHEAT H		
11	4	194	WHEAT H		
11	4	202	WHEAT H		

TABLE 17.— RAIN GAGE LOCATIONS, SECTION, TOWNSHIP, RANGE

Gage number	Location		
	Section	Township	Range
K2*	1	8	34
K3	3	8	33
K4	6	8	32
K5	21	8	32
K6	2	8	32
K7	24	8	32
K8	24	8	33
K9	31	8	32
K10	27	8	32
K11	32	8	31
K12	16	9	31
K13	13	9	32
K14	16	9	32
K15	32	9	31
K16	31	9	31
K17	12	10	32
K18	17	8	33
K19	15	8	34
K20	30	8	33
K21	4	9	34
K22	18	9	34
K23	14	9	34
K24	17	9	33
K25	34	8	33
K26	14	9	33
K27	31	9	32
K28	11	10	33
K29	34	9	33
K30	36	9	34
K31	28	9	34
K32	11	10	34
K33	8	10	33
K34	15	10	32
K35	30	10	33
K36	27	10	33
K37	31	10	32
K38	27	10	32
K39	14	8	33

*Gage K1 is located at Goodland Airport in Goodland, Kansas.

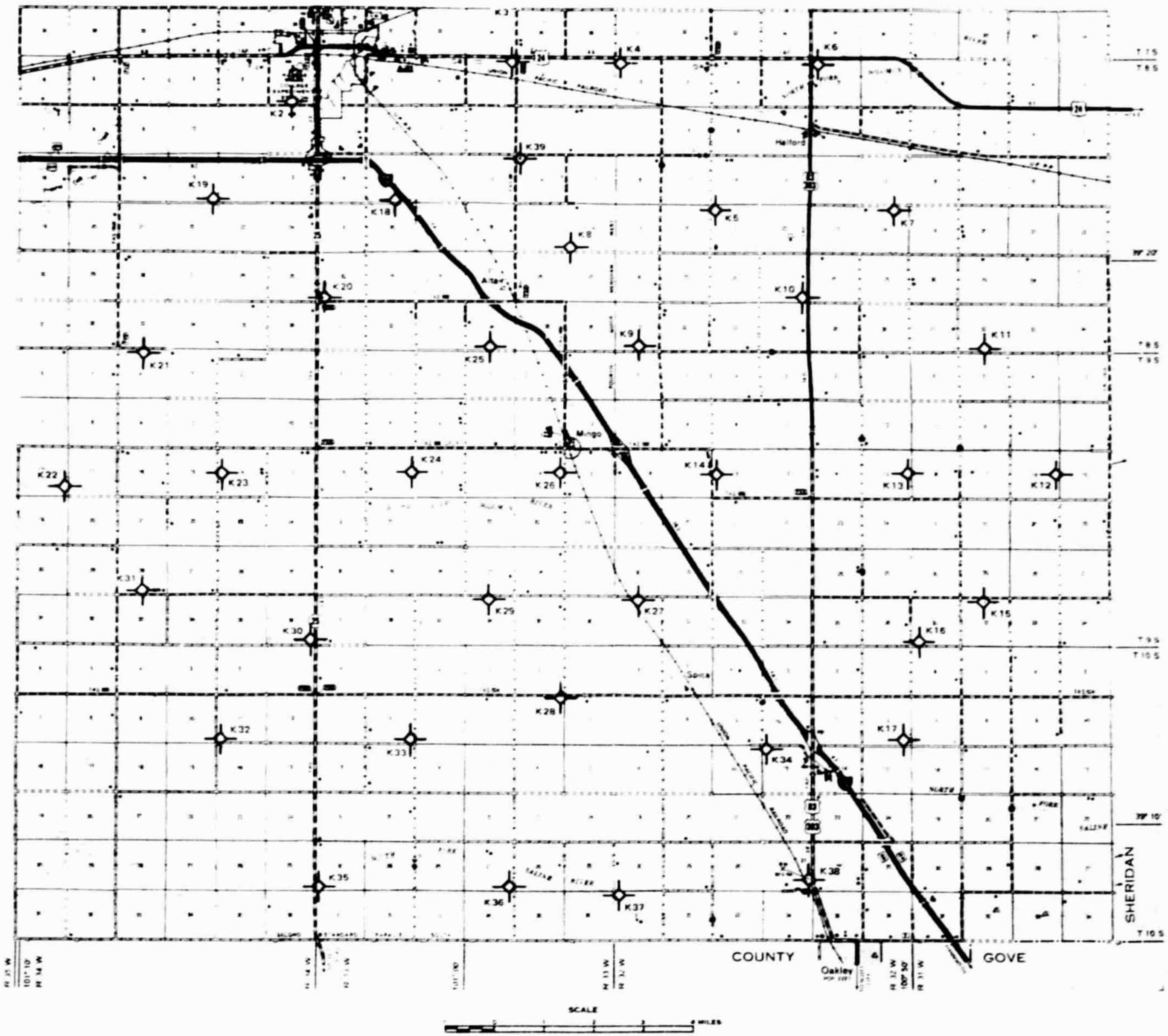


Figure 4.— Rain gage locations.

TABLE 18.– RECORDING RAIN GAGE DATA EXAMPLE

Rain gage number	Year	Day	Rainfall	
			mm	in.
K01	78	121	24.9	1.0
K01	78	122	7.4	0.3
K01	78	123	0.0	0.0
K01	78	124	0.0	0.0
K01	78	125	1.0	0.0
K01	78	126	24.9	1.0
K01	78	127	2.0	0.1
K01	78	131	0.0	0.0
K01	78	132	0.0	0.0
K01	78	133	0.0	0.0
K01	78	134	0.0	0.0
K01	78	135	0.0	0.0
K01	78	136	0.0	0.0
K01	78	137	0.0	0.0
K01	78	138	4.3	0.2
K01	78	139	0.0	0.0
K01	78	140	0.0	0.0
K01	78	141	0.0	0.0
K01	78	142	1.0	0.0
K01	78	143	0.0	0.0
K01	78	144	1.5	0.1
K01	78	145	4.3	0.2
K01	78	146	0.0	0.0
K01	78	147	0.0	0.0
K01	78	148	14.2	0.6
K01	78	153	0.0	0.0
K01	78	154	0.0	0.0
K01	78	155	23.9	0.9
K01	78	156	0.0	0.0
K01	78	157	10.2	0.4
K01	78	158	0.0	0.0
K01	78	162	0.0	0.0
K01	78	163	0.0	0.0
K01	78	164	0.0	0.0
K01	78	165	0.0	0.0
K01	78	166	0.0	0.0
K01	78	167	0.0	0.0
K01	78	168	0.0	0.0
K01	78	169	1.0	0.0
K01	78	170	0.0	0.0
K01	78	171	0.0	0.0
K01	78	172	0.3	0.0
K01	78	173	0.0	0.0
K01	78	174	0.0	0.0
K01	78	175	1.0	0.0
K01	78	176	0.0	0.0
K01	78	177	0.0	0.0
K01	78	178	9.7	0.4
K01	78	179	0.0	0.0
K01	78	180	0.0	0.0
K01	78	182	0.0	0.0
K01	78	183	0.0	0.0
K01	78	184	0.0	0.0
K01	78	185	0.0	0.0
K01	78	186	0.0	0.0
K01	78	187	0.0	0.0
K01	78	193	0.0	0.0
K01	78	194	2.5	0.1
K01	78	195	0.0	0.0
K01	78	196	0.0	0.0
K01	78	197	1.3	0.0
K01	78	198	0.0	0.0
K02	78	121	16.0	0.6
K02	78	122	6.3	0.2
K02	78	123	0.0	0.0
K02	78	124	0.0	0.0
K02	78	125	0.0	0.0
K02	78	126	29.2	1.1
K02	78	127	1.8	0.1
K02	78	128	0.0	0.0
K02	78	129	0.0	0.0
K02	78	130	0.0	0.0
K02	78	131	0.0	0.0
K02	78	132	0.0	0.0
K02	78	133	0.0	0.0
K02	78	134	0.0	0.0
K02	78	135	0.0	0.0
K02	78	136	0.0	0.0
K02	78	137	0.0	0.0

Rain gage number	Year	Day	Rainfall	
			mm	in.
K02	78	138	26.2	1.0
K02	78	139	0.0	0.0
K02	78	140	0.0	0.0
K02	78	141	0.0	0.0
K02	78	142	0.0	0.0
K02	78	143	0.0	0.0
K02	78	144	0.0	0.0
K02	78	145	0.0	0.0
K02	78	146	0.0	0.0
K02	78	147	0.0	0.0
K02	78	153	0.5	0.0
K02	78	154	0.0	0.0
K02	78	155	38.4	1.5
K02	78	156	0.0	0.0
K02	78	157	33.0	1.3
K02	78	158	0.5	0.0
K02	78	159	0.0	0.0
K02	78	160	0.0	0.0
K02	78	161	0.0	0.0
K02	78	162	0.0	0.0
K02	78	163	0.0	0.0
K02	78	164	0.0	0.0
K02	78	165	0.0	0.0
K02	78	166	0.0	0.0
K02	78	167	0.0	0.0
K02	78	168	0.0	0.0
K02	78	169	0.0	0.0
K02	78	170	0.0	0.0
K02	78	171	0.0	0.0
K02	78	172	0.0	0.0
K02	78	173	0.0	0.0
K02	78	174	0.0	0.0
K02	78	175	0.0	0.0
K02	78	176	0.0	0.0
K02	78	177	0.0	0.0
K02	78	178	2.8	0.1
K02	78	179	6.1	0.2
K02	78	180	0.0	0.0
K02	78	182	0.3	0.0
K02	78	183	0.0	0.0
K02	78	184	0.0	0.0
K02	78	185	0.0	0.0
K02	78	186	0.0	0.0
K02	78	187	0.0	0.0
K02	78	188	0.0	0.0
K02	78	189	0.0	0.0
K02	78	190	0.0	0.0
K02	78	191	0.0	0.0
K02	78	192	0.0	0.0
K02	78	193	0.0	0.0
K02	78	194	0.3	0.0
K02	78	195	0.0	0.0
K02	78	196	0.0	0.0
K02	78	197	0.0	0.0
K02	78	198	0.0	0.0
K02	78	199	0.0	0.0
K02	78	200	0.0	0.0
K02	78	201	19.6	0.8
K02	78	202	3.3	0.1
K02	78	203	4.3	0.2
K02	78	204	0.0	0.0
K02	78	205	0.0	0.0
K02	78	206	0.0	0.0
K02	78	207	0.0	0.0
K02	78	208	0.0	0.0
K02	78	209	0.0	0.0
K02	78	210	0.0	0.0
K02	78	211	0.0	0.0
K02	78	213	0.0	0.0
K02	78	214	1.0	0.0
K02	78	215	3.0	0.1
K02	78	216	2.0	0.1
K02	78	217	0.0	0.0
K02	78	218	0.0	0.0
K02	78	219	0.0	0.0
K02	78	220	0.0	0.0
K02	78	221	0.0	0.0
K02	78	222	0.0	0.0
K02	78	223	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall mm	Rainfall in.
K02	78	224	0.0	0.0
K02	78	225	0.0	0.0
K02	78	226	0.8	0.0
K02	78	227	0.0	0.0
K02	78	228	0.0	0.0
K02	78	229	0.0	0.0
K02	78	230	0.0	0.0
K02	78	231	0.0	0.0
K02	78	232	0.0	0.0
K02	78	233	0.0	0.0
K02	78	234	0.0	0.0
K02	78	235	0.0	0.0
K02	78	236	0.0	0.0
K02	78	237	0.0	0.0
K02	78	238	1.8	0.1
K02	78	239	0.0	0.0
K02	78	240	0.0	0.0
K02	78	241	0.0	0.0
K02	78	242	0.0	0.0
K03	78	121	16.3	0.6
K03	78	122	8.1	0.3
K03	78	123	0.0	0.0
K03	78	124	0.0	0.0
K03	78	125	0.0	0.0
K03	78	126	34.3	1.3
K03	78	127	2.3	0.1
K03	78	128	0.0	0.0
K03	78	129	0.0	0.0
K03	78	130	0.0	0.0
K03	78	131	0.0	0.0
K03	78	132	0.8	0.0
K03	78	133	0.0	0.0
K03	78	134	0.0	0.0
K03	78	135	0.0	0.0
K03	78	136	0.0	0.0
K03	78	137	0.0	0.0
K03	78	138	16.5	0.6
K03	78	139	0.0	0.0
K03	78	140	0.0	0.0
K03	78	141	0.0	0.0
K03	78	142	0.0	0.0
K03	78	143	0.0	0.0
K03	78	144	0.0	0.0
K03	78	145	0.0	0.0
K03	78	146	0.0	0.0
K03	78	147	0.0	0.0
K03	78	153	0.5	0.0
K03	78	154	0.0	0.0
K03	78	155	31.7	1.2
K03	78	156	0.0	0.0
K03	78	158	0.5	0.0
K03	78	159	0.0	0.0
K03	78	160	0.0	0.0
K03	78	161	0.0	0.0
K03	78	162	0.0	0.0
K03	78	163	0.0	0.0
K03	78	164	0.0	0.0
K03	78	165	0.0	0.0
K03	78	166	0.0	0.0
K03	78	167	0.0	0.0
K03	78	168	0.0	0.0
K03	78	169	0.0	0.0
K03	78	170	0.0	0.0
K03	78	171	0.0	0.0
K03	78	172	0.0	0.0
K03	78	173	0.0	0.0
K03	78	174	0.0	0.0
K03	78	175	0.0	0.0
K03	78	176	0.0	0.0
K03	78	177	0.0	0.0
K03	78	178	4.8	0.2
K03	78	179	2.3	0.1
K03	78	180	0.0	0.0
K03	78	182	0.5	0.0
K03	78	183	0.0	0.0
K03	78	184	0.0	0.0
K03	78	185	0.0	0.0
K03	78	186	0.0	0.0
K03	78	187	0.0	0.0

Rain gage number	Year	Day	Rainfall mm	Rainfall in.
K03	78	188	0.0	0.0
K03	78	189	0.0	0.0
K03	78	190	0.0	0.0
K03	78	191	0.0	0.0
K03	78	192	0.0	0.0
K03	78	193	0.0	0.0
K03	78	194	0.0	0.0
K03	78	195	0.0	0.0
K03	78	196	0.0	0.0
K03	78	197	0.0	0.0
K03	78	198	0.0	0.0
K03	78	199	0.0	0.0
K03	78	200	0.0	0.0
K03	78	201	22.6	0.9
K03	78	202	9.9	0.4
K03	78	203	2.5	0.1
K03	78	204	0.0	0.0
K03	78	205	0.0	0.0
K03	78	206	0.0	0.0
K03	78	207	0.0	0.0
K03	78	208	0.0	0.0
K03	78	209	0.0	0.0
K03	78	210	0.0	0.0
K03	78	211	0.8	0.0
K03	78	213	6.0	0.2
K03	78	214	1.5	0.1
K03	78	215	2.0	0.1
K03	78	216	0.0	0.0
K03	78	217	0.0	0.0
K03	78	218	0.0	0.0
K03	78	219	0.0	0.0
K03	78	220	0.0	0.0
K03	78	221	0.0	0.0
K03	78	222	0.0	0.0
K03	78	223	0.0	0.0
K03	78	224	0.0	0.0
K03	78	225	0.0	0.0
K03	78	234	0.0	0.0
K03	78	235	0.0	0.0
K03	78	236	0.0	0.0
K03	78	237	0.3	0.0
K03	78	238	2.8	0.1
K03	78	239	0.0	0.0
K03	78	240	0.0	0.0
K03	78	241	0.6	0.0
K03	78	242	0.0	0.0
K04	78	121	14.0	0.5
K04	78	122	9.7	0.4
K04	78	123	0.0	0.0
K04	78	124	0.0	0.0
K04	78	125	0.3	0.0
K04	78	126	25.7	1.0
K04	78	127	0.8	0.0
K04	78	128	0.0	0.0
K04	78	129	0.0	0.0
K04	78	130	0.0	0.0
K04	78	131	0.0	0.0
K04	78	132	0.3	0.0
K04	78	133	0.0	0.0
K04	78	134	0.0	0.0
K04	78	135	0.0	0.0
K04	78	136	0.0	0.0
K04	78	137	0.0	0.0
K04	78	138	10.7	0.4
K04	78	139	0.5	0.0
K04	78	140	0.0	0.0
K04	78	141	0.0	0.0
K04	78	142	0.0	0.0
K04	78	143	0.0	0.0
K04	78	144	0.0	0.0
K04	78	145	0.0	0.0
K04	78	146	0.0	0.0
K04	78	147	0.0	0.0
K04	78	153	1.3	0.0
K04	78	154	0.0	0.0
K04	78	155	43.2	1.7
K04	78	156	0.0	0.0
K04	78	158	0.0	0.0
K04	78	159	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K04	78	160	0.0	0.0
K04	78	161	0.0	0.0
K04	78	162	0.0	0.0
K04	78	163	0.0	0.0
K04	78	164	0.0	0.0
K04	78	165	0.0	0.0
K04	78	166	0.0	0.0
K04	78	167	0.0	0.0
K04	78	168	0.0	0.0
K04	78	169	0.0	0.0
K04	78	170	0.0	0.0
K04	78	171	0.0	0.0
K04	78	172	0.0	0.0
K04	78	173	0.0	0.0
K04	78	174	0.0	0.0
K04	78	175	0.0	0.0
K04	78	176	0.0	0.0
K04	78	177	0.0	0.0
K04	78	178	3.6	0.1
K04	78	179	0.0	0.0
K04	78	180	0.0	0.0
K04	78	182	0.0	0.0
K04	78	183	0.0	0.0
K04	78	184	0.0	0.0
K04	78	185	0.0	0.0
K04	78	186	0.0	0.0
K04	78	187	0.5	0.0
K04	78	188	0.0	0.0
K04	78	189	0.0	0.0
K04	78	190	0.0	0.0
K04	78	191	0.0	0.0
K04	78	192	0.0	0.0
K04	78	193	0.0	0.0
K04	78	194	0.0	0.0
K04	78	195	0.0	0.0
K04	78	196	0.0	0.0
K04	78	197	0.0	0.0
K04	78	206	0.0	0.0
K04	78	207	0.0	0.0
K04	78	208	0.0	0.0
K04	78	209	0.0	0.0
K04	78	210	0.0	0.0
K04	78	211	1.0	0.0
K04	78	213	9.0	0.3
K04	78	214	1.0	0.0
K04	78	215	1.3	0.0
K04	78	216	0.0	0.0
K04	78	217	0.0	0.0
K04	78	218	0.0	0.0
K04	78	219	0.0	0.0
K04	78	220	0.0	0.0
K04	78	221	0.0	0.0
K04	78	222	0.0	0.0
K04	78	223	0.0	0.0
K04	78	224	0.0	0.0
K04	78	225	0.0	0.0
K04	78	226	0.0	0.0
K04	78	227	24.1	0.9
K04	78	228	0.0	0.0
K04	78	229	0.0	0.0
K04	78	230	0.0	0.0
K04	78	231	0.0	0.0
K04	78	232	0.0	0.0
K04	78	233	0.0	0.0
K04	78	234	0.0	0.0
K04	78	235	0.0	0.0
K04	78	236	0.0	0.0
K04	78	237	0.3	0.0
K04	78	238	0.8	0.0
K04	78	239	0.0	0.0
K04	78	240	0.0	0.0
K04	78	241	0.0	0.0
K04	78	242	0.0	0.0
K05	78	121	20.1	0.8
K05	78	122	9.7	0.4
K05	78	123	0.0	0.0
K05	78	124	0.0	0.0
K05	78	125	0.3	0.0
K05	78	126	41.4	1.6
K05	78	127	5.8	0.2
K05	78	128	0.0	0.0
K05	78	129	0.0	0.0
K05	78	130	0.0	0.0
K05	78	131	0.0	0.0
K05	78	132	0.5	0.0
K05	78	133	0.0	0.0
K05	78	134	0.0	0.0
K05	78	135	0.0	0.0
K05	78	136	0.0	0.0
K05	78	137	0.0	0.0
K05	78	138	17.0	0.7
K05	78	139	0.0	0.0
K05	78	140	0.0	0.0
K05	78	141	0.0	0.0
K05	78	142	0.0	0.0
K05	78	143	0.0	0.0
K05	78	144	0.0	0.0
K05	78	145	0.0	0.0
K05	78	146	0.0	0.0
K05	78	147	0.0	0.0
K05	78	153	0.8	0.0
K05	78	154	3.6	0.1
K05	78	155	53.8	2.1
K05	78	156	0.8	0.0
K05	78	157	22.6	0.9
K05	78	158	1.3	0.0
K05	78	159	0.0	0.0
K05	78	160	0.0	0.0
K05	78	161	0.0	0.0
K05	78	162	0.0	0.0
K05	78	163	0.0	0.0
K05	78	164	0.0	0.0
K05	78	165	0.0	0.0
K05	78	166	0.0	0.0
K05	78	167	0.0	0.0
K05	78	168	0.0	0.0
K05	78	169	1.3	0.0
K05	78	170	0.0	0.0
K05	78	171	2.8	0.1
K05	78	172	0.0	0.0
K05	78	173	0.0	0.0
K05	78	174	0.0	0.0
K05	78	175	0.0	0.0
K05	78	176	0.0	0.0
K05	78	177	0.0	0.0
K05	78	178	8.1	0.3
K05	78	179	0.3	0.0
K05	78	180	0.0	0.0
K05	78	182	0.3	0.0
K05	78	183	0.0	0.0
K05	78	184	0.0	0.0
K05	78	185	0.0	0.0
K05	78	186	0.0	0.0
K05	78	187	0.0	0.0
K05	78	188	0.0	0.0
K05	78	189	0.0	0.0
K05	78	190	0.0	0.0
K05	78	191	0.0	0.0
K05	78	192	0.0	0.0
K05	78	193	1.3	0.0
K05	78	194	0.0	0.0
K05	78	195	0.0	0.0
K05	78	196	0.0	0.0
K05	78	197	0.0	0.0
K05	78	198	0.0	0.0
K05	78	199	0.0	0.0
K05	78	200	0.0	0.0
K05	78	201	20.3	0.8
K05	78	202	10.4	0.4
K05	78	203	5.8	0.2
K05	78	204	2.0	0.1
K05	78	205	1.3	0.0
K05	78	206	0.0	0.0
K05	78	207	0.0	0.0
K05	78	208	0.0	0.0
K05	78	209	0.0	0.0
K05	78	210	0.0	0.0
K05	78	211	3.0	0.1

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K05	78	213	9.0	0.3
K05	78	214	1.8	0.1
K05	78	215	1.5	0.1
K05	78	216	0.0	0.0
K05	78	217	0.0	0.0
K05	78	218	0.0	0.0
K05	78	219	0.0	0.0
K05	78	220	0.0	0.0
K05	78	221	0.0	0.0
K05	78	222	0.0	0.0
K05	78	223	0.0	0.0
K05	78	224	0.0	0.0
K05	78	225	0.0	0.0
K05	78	226	0.0	0.0
K05	78	227	13.2	0.5
K05	78	228	0.0	0.0
K05	78	229	0.0	0.0
K05	78	230	0.0	0.0
K05	78	231	0.0	0.0
K05	78	232	0.0	0.0
K05	78	233	0.0	0.0
K05	78	234	0.0	0.0
K05	78	235	0.0	0.0
K05	78	236	0.0	0.0
K05	78	237	0.3	0.0
K05	78	238	3.3	0.1
K05	78	239	0.0	0.0
K05	78	240	0.0	0.0
K05	78	241	0.0	0.0
K05	78	242	0.5	0.0
K06	78	121	15.7	0.6
K06	78	122	7.4	0.3
K06	78	123	0.0	0.0
K06	78	124	0.0	0.0
K06	78	125	0.3	0.0
K06	78	126	26.7	1.0
K06	78	127	0.0	0.0
K06	78	128	0.0	0.0
K06	78	129	0.0	0.0
K06	78	130	0.0	0.0
K06	78	131	0.0	0.0
K06	78	132	0.8	0.0
K06	78	133	0.0	0.0
K06	78	134	0.0	0.0
K06	78	135	0.0	0.0
K06	78	136	0.0	0.0
K06	78	137	0.0	0.0
K06	78	138	11.4	0.4
K06	78	139	0.0	0.0
K06	78	140	0.0	0.0
K06	78	141	0.0	0.0
K06	78	142	0.0	0.0
K06	78	143	0.0	0.0
K06	78	144	0.0	0.0
K06	78	145	0.0	0.0
K06	78	146	0.0	0.0
K06	78	147	0.0	0.0
K06	78	153	1.5	0.1
K06	78	154	0.3	0.0
K06	78	155	41.9	1.6
K06	78	156	0.0	0.0
K06	78	157	19.8	0.8
K06	78	158	0.0	0.0
K06	78	159	0.0	0.0
K06	78	160	0.0	0.0
K06	78	161	0.0	0.0
K06	78	162	0.0	0.0
K06	78	163	0.0	0.0
K06	78	164	0.0	0.0
K06	78	165	0.0	0.0
K06	78	166	0.0	0.0
K06	78	167	0.0	0.0
K06	78	168	0.0	0.0
K06	78	169	0.0	0.0
K06	78	170	0.0	0.0
K06	78	171	0.0	0.0
K06	78	172	0.0	0.0
K06	78	173	0.0	0.0
K06	78	174	0.0	0.0

Rain gage number	Year	Day	Rainfall	
			mm	in.
K06	78	175	0.0	0.0
K06	78	176	0.0	0.0
K06	78	177	0.0	0.0
K06	78	178	4.3	0.2
K06	78	179	0.0	0.0
K06	78	180	0.0	0.0
K06	78	182	0.0	0.0
K06	78	183	0.0	0.0
K06	78	184	0.0	0.0
K06	78	185	0.0	0.0
K06	78	186	0.0	0.0
K06	78	187	0.3	0.0
K06	78	188	0.0	0.0
K06	78	189	0.0	0.0
K06	78	190	0.0	0.0
K06	78	191	0.0	0.0
K06	78	192	0.0	0.0
K06	78	193	0.0	0.0
K06	78	194	0.0	0.0
K06	78	195	0.0	0.0
K06	78	196	0.0	0.0
K06	78	197	0.0	0.0
K06	78	198	0.0	0.0
K06	78	199	0.0	0.0
K06	78	200	0.0	0.0
K06	78	201	18.3	0.7
K06	78	202	8.1	0.3
K06	78	203	6.3	0.2
K06	78	204	0.0	0.0
K06	78	205	0.0	0.0
K06	78	206	0.0	0.0
K06	78	207	0.0	0.0
K06	78	208	0.0	0.0
K06	78	209	0.0	0.0
K06	78	210	0.0	0.0
K06	78	211	1.8	0.1
K06	78	213	13.0	0.5
K06	78	214	0.8	0.0
K06	78	215	0.0	0.0
K06	78	216	0.0	0.0
K06	78	217	0.0	0.0
K06	78	218	0.0	0.0
K06	78	219	0.0	0.0
K06	78	220	0.0	0.0
K06	78	221	0.0	0.0
K06	78	222	0.0	0.0
K06	78	223	0.0	0.0
K06	78	224	0.0	0.0
K06	78	225	0.0	0.0
K06	78	235	0.0	0.0
K06	78	236	0.0	0.0
K06	78	237	0.5	0.0
K06	78	238	0.5	0.0
K06	78	239	0.0	0.0
K06	78	240	0.0	0.0
K06	78	241	0.0	0.0
K06	78	242	0.0	0.0
K07	78	121	17.3	0.7
K07	78	122	5.8	0.2
K07	78	123	0.0	0.0
K07	78	124	0.0	0.0
K07	78	125	0.3	0.0
K07	78	126	26.2	1.0
K07	78	127	0.3	0.0
K07	78	128	0.0	0.0
K07	78	129	0.0	0.0
K07	78	130	0.0	0.0
K07	78	131	0.0	0.0
K07	78	132	0.0	0.0
K07	78	133	0.0	0.0
K07	78	134	0.0	0.0
K07	78	135	0.0	0.0
K07	78	136	0.0	0.0
K07	78	137	0.0	0.0
K07	78	138	13.0	0.5
K07	78	139	0.0	0.0
K07	78	140	0.0	0.0
K07	78	141	0.0	0.0
K07	78	142	0.0	0.0

TABLE 18.— Continued.

Rain gage number	Year	Day	Rainfall mm	Rainfall in.
K07	78	143	0.0	0.0
K07	78	144	0.0	0.0
K07	78	145	0.0	0.0
K07	78	146	0.0	0.0
K07	78	147	0.0	0.0
K07	78	153	1.3	0.0
K07	78	154	4.3	0.2
K07	78	155	31.7	1.2
K07	78	156	0.0	0.0
K07	78	157	34.3	1.3
K07	78	158	0.3	0.0
K07	78	159	0.0	0.0
K07	78	160	0.0	0.0
K07	78	161	0.0	0.0
K07	78	162	0.0	0.0
K07	78	163	0.0	0.0
K07	78	164	0.0	0.0
K07	78	165	0.0	0.0
K07	78	166	0.0	0.0
K07	78	167	0.0	0.0
K07	78	168	0.0	0.0
K07	78	169	0.8	0.0
K07	78	170	0.0	0.0
K07	78	171	4.6	0.2
K07	78	172	0.0	0.0
K07	78	173	0.0	0.0
K07	78	174	0.0	0.0
K07	78	175	0.0	0.0
K07	78	176	0.0	0.0
K07	78	177	0.0	0.0
K07	78	178	8.1	0.3
K07	78	179	0.0	0.0
K07	78	180	0.0	0.0
K07	78	182	0.0	0.0
K07	78	183	0.0	0.0
K07	78	184	0.3	0.0
K07	78	185	0.0	0.0
K07	78	186	0.0	0.0
K07	78	187	1.5	0.1
K07	78	188	0.0	0.0
K07	78	189	0.0	0.0
K07	78	190	0.0	0.0
K07	78	191	0.0	0.0
K07	78	192	0.0	0.0
K07	78	193	0.0	0.0
K07	78	194	0.0	0.0
K07	78	195	0.0	0.0
K07	78	196	0.0	0.0
K07	78	197	0.0	0.0
K07	78	198	0.0	0.0
K07	78	199	0.0	0.0
K07	78	200	0.0	0.0
K07	78	201	9.7	0.4
K07	78	202	10.7	0.4
K07	78	203	12.2	0.5
K07	78	204	0.0	0.0
K07	78	205	0.0	0.0
K07	78	206	0.0	0.0
K07	78	207	0.0	0.0
K07	78	208	0.0	0.0
K07	78	209	0.0	0.0
K07	78	210	0.0	0.0
K07	78	211	1.8	0.1
K07	78	213	12.0	0.5
K07	78	214	1.0	0.0
K07	78	215	0.3	0.0
K07	78	216	0.0	0.0
K07	78	217	0.8	0.0
K07	78	218	0.0	0.0
K07	78	219	0.0	0.0
K07	78	220	0.0	0.0
K07	78	221	0.0	0.0
K07	78	222	0.3	0.0
K07	78	223	0.0	0.0
K07	78	224	0.0	0.0
K07	78	225	0.0	0.0
K07	78	228	0.0	0.0
K07	78	229	0.0	0.0
K07	78	230	0.0	0.0

Rain gage number	Year	Day	Rainfall mm	Rainfall in.
K07	78	231	0.0	0.0
K07	78	232	0.0	0.0
K07	78	233	0.0	0.0
K07	78	234	0.0	0.0
K07	78	235	0.0	0.0
K07	78	236	0.0	0.0
K07	78	237	0.5	0.0
K07	78	238	1.8	0.1
K07	78	239	0.0	0.0
K07	78	240	0.0	0.0
K07	78	241	0.0	0.0
K07	78	242	0.3	0.0
K08	78	121	18.5	0.7
K08	78	122	7.1	0.3
K08	78	123	0.0	0.0
K08	78	124	0.0	0.0
K08	78	125	0.0	0.0
K08	78	126	29.0	1.1
K08	78	127	0.3	0.0
K08	78	128	0.0	0.0
K08	78	129	0.0	0.0
K08	78	130	0.0	0.0
K08	78	131	0.0	0.0
K08	78	132	0.0	0.0
K08	78	133	0.0	0.0
K08	78	134	0.0	0.0
K08	78	135	0.0	0.0
K08	78	136	0.0	0.0
K08	78	137	0.0	0.0
K08	78	138	13.2	0.5
K08	78	139	0.0	0.0
K08	78	140	0.0	0.0
K08	78	141	0.0	0.0
K08	78	142	0.0	0.0
K08	78	143	0.0	0.0
K08	78	144	0.0	0.0
K08	78	145	0.0	0.0
K08	78	146	0.0	0.0
K08	78	147	0.0	0.0
K08	78	153	0.5	0.0
K08	78	154	0.8	0.0
K08	78	155	85.1	3.3
K08	78	156	0.0	0.0
K08	78	160	0.0	0.0
K08	78	161	0.0	0.0
K08	78	162	0.0	0.0
K08	78	163	0.0	0.0
K08	78	164	0.0	0.0
K08	78	165	0.0	0.0
K08	78	166	0.0	0.0
K08	78	167	0.0	0.0
K08	78	168	0.0	0.0
K08	78	169	0.8	0.0
K08	78	170	0.0	0.0
K08	78	171	5.3	0.2
K08	78	172	0.0	0.0
K08	78	173	0.0	0.0
K08	78	174	0.0	0.0
K08	78	175	0.0	0.0
K08	78	176	0.0	0.0
K08	78	177	0.0	0.0
K08	78	178	6.6	0.3
K08	78	179	3.0	0.1
K08	78	180	0.0	0.0
K08	78	182	0.0	0.0
K08	78	183	0.0	0.0
K08	78	184	0.0	0.0
K08	78	185	0.0	0.0
K08	78	186	0.0	0.0
K08	78	187	0.0	0.0
K08	78	188	0.0	0.0
K08	78	189	0.0	0.0
K08	78	190	0.0	0.0
K08	78	191	0.0	0.0
K08	78	192	0.0	0.0
K08	78	193	0.0	0.0
K08	78	194	0.0	0.0
K08	78	195	0.0	0.0
K08	78	196	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K08	78	197	0.0	0.0
K08	78	198	0.0	0.0
K08	78	199	0.0	0.0
K08	78	200	0.0	0.0
K08	78	201	16.5	0.6
K08	78	202	5.6	0.2
K08	78	203	5.6	0.2
K08	78	204	0.0	0.0
K08	78	205	0.0	0.0
K08	78	206	0.0	0.0
K08	78	207	0.0	0.0
K08	78	208	0.0	0.0
K08	78	209	0.0	0.0
K08	78	210	0.0	0.0
K08	78	211	1.8	0.1
K08	78	213	0.3	0.0
K08	78	214	2.5	0.1
K08	78	215	1.5	0.1
K08	78	216	0.5	0.0
K08	78	217	0.0	0.0
K08	78	218	0.0	0.0
K08	78	219	0.0	0.0
K08	78	220	0.0	0.0
K08	78	221	0.0	0.0
K08	78	222	0.0	0.0
K08	78	223	0.0	0.0
K08	78	224	0.0	0.0
K08	78	225	0.0	0.0
K08	78	226	0.0	0.0
K08	78	227	12.2	0.5
K08	78	228	0.0	0.0
K08	78	229	0.0	0.0
K08	78	230	0.0	0.0
K08	78	231	0.0	0.0
K08	78	232	0.0	0.0
K08	78	233	0.0	0.0
K08	78	234	0.0	0.0
K08	78	235	0.0	0.0
K08	78	236	0.0	0.0
K08	78	237	0.0	0.0
K08	78	238	1.8	0.1
K08	78	239	0.0	0.0
K08	78	240	0.0	0.0
K08	78	241	0.0	0.0
K08	78	242	0.3	0.0
K09	78	121	18.8	0.7
K09	78	122	6.3	0.2
K09	78	123	0.0	0.0
K09	78	124	0.0	0.0
K09	78	125	0.0	0.0
K09	78	126	33.8	1.3
K09	78	127	4.8	0.2
K09	78	128	0.0	0.0
K09	78	129	0.0	0.0
K09	78	130	0.0	0.0
K09	78	131	0.0	0.0
K09	78	132	0.5	0.0
K09	78	133	0.0	0.0
K09	78	134	0.0	0.0
K09	78	135	0.0	0.0
K09	78	137	0.0	0.0
K09	78	138	12.4	0.5
K09	78	139	0.0	0.0
K09	78	140	0.0	0.0
K09	78	141	0.0	0.0
K09	78	142	0.0	0.0
K09	78	143	0.0	0.0
K09	78	144	0.0	0.0
K09	78	145	0.0	0.0
K09	78	146	0.0	0.0
K09	78	147	0.8	0.0
K09	78	153	3.3	0.1
K09	78	154	1.5	0.1
K09	78	155	49.5	1.9
K09	78	156	0.0	0.0
K09	78	162	0.0	0.0
K09	78	163	0.0	0.0
K09	78	164	0.0	0.0
K09	78	165	0.0	0.0
K09	78	166	0.0	0.0
K09	78	167	0.0	0.0
K09	78	168	0.0	0.0
K09	78	169	1.3	0.0
K09	78	170	0.0	0.0
K09	78	171	5.6	0.2
K09	78	172	0.0	0.0
K09	78	173	0.0	0.0
K09	78	174	0.0	0.0
K09	78	175	0.0	0.0
K09	78	176	0.0	0.0
K09	78	177	0.0	0.0
K09	78	178	9.7	0.4
K09	78	179	1.3	0.0
K09	78	180	0.0	0.0
K09	78	182	0.3	0.0
K09	78	183	0.0	0.0
K09	78	184	0.3	0.0
K09	78	185	0.0	0.0
K09	78	186	0.0	0.0
K09	78	187	0.0	0.0
K09	78	188	0.0	0.0
K09	78	189	0.0	0.0
K09	78	190	0.0	0.0
K09	78	191	0.0	0.0
K09	78	192	0.0	0.0
K09	78	193	0.0	0.0
K09	78	194	0.0	0.0
K09	78	195	0.0	0.0
K09	78	196	0.0	0.0
K09	78	197	0.0	0.0
K09	78	198	0.0	0.0
K09	78	199	0.0	0.0
K09	78	200	0.0	0.0
K09	78	201	17.3	0.7
K09	78	202	7.6	0.3
K09	78	203	5.3	0.2
K09	78	204	0.0	0.0
K09	78	205	0.0	0.0
K09	78	206	0.0	0.0
K09	78	207	0.0	0.0
K09	78	208	0.0	0.0
K09	78	209	0.0	0.0
K09	78	210	0.0	0.0
K09	78	211	1.3	0.0
K09	78	213	0.0	0.0
K09	78	214	2.8	0.1
K09	78	215	1.3	0.0
K09	78	216	0.3	0.0
K09	78	217	0.0	0.0
K09	78	218	0.0	0.0
K09	78	219	0.0	0.0
K09	78	220	0.0	0.0
K09	78	221	0.0	0.0
K09	78	222	0.0	0.0
K09	78	223	0.0	0.0
K09	78	224	0.0	0.0
K09	78	225	0.0	0.0
K09	78	226	0.0	0.0
K09	78	227	18.8	0.7
K09	78	228	0.0	0.0
K09	78	229	0.0	0.0
K09	78	230	0.0	0.0
K09	78	231	0.0	0.0
K09	78	232	0.0	0.0
K09	78	233	0.0	0.0
K09	78	234	0.0	0.0
K09	78	235	0.0	0.0
K09	78	236	0.0	0.0
K09	78	237	0.0	0.0
K09	78	238	7.4	0.3
K09	78	239	0.0	0.0
K09	78	240	0.0	0.0
K09	78	241	0.0	0.0
K09	78	242	0.0	0.0
K10	78	121	17.3	0.7
K10	78	122	5.6	[illegible]
K10	78	123	0.0	0.0
K10	78	124	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall, mm	Rainfall, in.
K10	78	126	27.4	1.1
K10	78	127	0.5	0.0
K10	78	128	0.0	0.0
K10	78	129	0.0	0.0
K10	78	134	0.0	0.0
K10	78	135	0.0	0.0
K10	78	136	0.0	0.0
K10	78	137	0.0	0.0
K10	78	138	16.3	0.6
K10	78	139	0.0	0.0
K10	78	140	0.0	0.0
K10	78	141	0.0	0.0
K10	78	142	0.0	0.0
K10	78	143	0.0	0.0
K10	78	144	0.0	0.0
K10	78	145	0.0	0.0
K10	78	146	0.0	0.0
K10	78	147	0.5	0.0
K10	78	153	2.8	0.1
K10	78	154	1.8	0.1
K10	78	155	47.8	1.9
K10	78	156	0.0	0.0
K10	78	157	50.8	2.0
K10	78	158	0.0	0.0
K10	78	159	0.0	0.0
K10	78	160	0.0	0.0
K10	78	161	0.0	0.0
K10	78	162	0.0	0.0
K10	78	163	0.0	0.0
K10	78	164	0.0	0.0
K10	78	165	0.0	0.0
K10	78	166	0.0	0.0
K10	78	167	0.0	0.0
K10	78	168	0.0	0.0
K10	78	169	1.3	0.0
K10	78	170	0.0	0.0
K10	78	171	0.8	0.0
K10	78	172	0.0	0.0
K10	78	173	0.0	0.0
K10	78	174	0.0	0.0
K10	78	175	0.0	0.0
K10	78	176	0.0	0.0
K10	78	177	0.0	0.0
K10	78	178	13.0	0.5
K10	78	179	0.0	0.0
K10	78	180	0.0	0.0
K10	78	182	0.0	0.0
K10	78	183	0.0	0.0
K10	78	184	0.0	0.0
K10	78	185	0.0	0.0
K10	78	186	0.0	0.0
K10	78	187	0.0	0.0
K10	78	188	0.0	0.0
K10	78	189	0.0	0.0
K10	78	190	0.0	0.0
K10	78	191	0.0	0.0
K10	78	192	0.0	0.0
K10	78	193	0.0	0.0
K10	78	194	0.0	0.0
K10	78	195	0.0	0.0
K10	78	196	0.0	0.0
K10	78	197	0.0	0.0
K10	78	198	0.0	0.0
K10	78	199	0.0	0.0
K10	78	200	0.0	0.0
K10	78	201	10.4	0.4
K10	78	202	14.0	0.5
K10	78	203	8.6	0.3
K10	78	204	0.0	0.0
K10	78	205	0.0	0.0
K10	78	206	0.0	0.0
K10	78	207	0.0	0.0
K10	78	208	0.0	0.0
K10	78	209	0.0	0.0
K10	78	210	0.0	0.0
K10	78	211	1.3	0.0
K10	78	213	4.0	0.2
K10	78	214	0.8	0.0
K10	78	215	0.8	0.0
K10	78	216	0.0	0.0
K10	78	217	0.0	0.0
K10	78	218	0.0	0.0
K10	78	219	0.0	0.0
K10	78	220	0.0	0.0
K10	78	221	0.0	0.0
K10	78	222	0.0	0.0
K10	78	223	0.0	0.0
K10	78	224	0.0	0.0
K10	78	225	0.0	0.0
K10	78	226	0.0	0.0
K10	78	227	19.3	0.8
K10	78	228	0.0	0.0
K10	78	229	0.0	0.0
K10	78	230	0.0	0.0
K10	78	231	0.0	0.0
K10	78	232	0.0	0.0
K10	78	233	0.0	0.0
K10	78	234	0.0	0.0
K10	78	235	0.0	0.0
K10	78	236	0.0	0.0
K10	78	237	0.3	0.0
K10	78	238	3.3	0.1
K10	78	239	0.0	0.0
K10	78	240	0.0	0.0
K10	78	241	0.0	0.0
K10	78	242	0.0	0.0
K11	78	121	16.3	0.6
K11	78	122	5.3	0.2
K11	78	123	0.0	0.0
K11	78	124	0.0	0.0
K11	78	126	26.2	1.0
K11	78	127	0.0	0.0
K11	78	128	0.0	0.0
K11	78	129	0.0	0.0
K11	78	130	0.0	0.0
K11	78	131	0.0	0.0
K11	78	132	0.0	0.0
K11	78	133	0.0	0.0
K11	78	134	0.0	0.0
K11	78	135	0.0	0.0
K11	78	136	0.0	0.0
K11	78	137	0.0	0.0
K11	78	138	9.1	0.4
K11	78	141	0.0	0.0
K11	78	142	0.0	0.0
K11	78	143	0.0	0.0
K11	78	144	1.8	0.1
K11	78	145	0.0	0.0
K11	78	146	0.0	0.0
K11	78	147	0.0	0.0
K11	78	153	2.0	0.1
K11	78	154	0.3	0.0
K11	78	155	43.9	1.7
K11	78	156	0.0	0.0
K11	78	157	22.1	0.9
K11	78	158	0.5	0.0
K11	78	159	0.0	0.0
K11	78	160	0.0	0.0
K11	78	161	0.0	0.0
K11	78	162	0.0	0.0
K11	78	163	0.0	0.0
K11	78	164	0.0	0.0
K11	78	165	0.0	0.0
K11	78	166	0.0	0.0
K11	78	167	0.0	0.0
K11	78	168	0.0	0.0
K11	78	169	0.5	0.0
K11	78	170	0.0	0.0
K11	78	171	0.5	0.0
K11	78	172	0.0	0.0
K11	78	173	0.0	0.0
K11	78	174	0.0	0.0
K11	78	175	0.0	0.0
K11	78	176	0.0	0.0
K11	78	177	0.0	0.0
K11	78	178	23.6	0.9
K11	78	179	1.3	0.0
K11	78	180	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall mm	Rainfall in.
K11	78	182	1.3	0.0
K11	78	183	0.0	0.0
K11	78	184	0.0	0.0
K11	78	185	0.0	0.0
K11	78	186	0.0	0.0
K11	78	187	0.0	0.0
K11	78	188	0.0	0.0
K11	78	189	0.0	0.0
K11	78	190	0.0	0.0
K11	78	191	0.0	0.0
K11	78	192	0.0	0.0
K11	78	193	0.0	0.0
K11	78	194	0.0	0.0
K11	78	195	0.0	0.0
K11	78	196	0.0	0.0
K11	78	197	0.0	0.0
K11	78	198	0.0	0.0
K11	78	199	0.0	0.0
K11	78	200	0.0	0.0
K11	78	201	6.3	0.2
K11	78	202	14.5	0.6
K11	78	203	7.1	0.3
K11	78	204	0.0	0.0
K11	78	205	0.0	0.0
K11	78	206	0.0	0.0
K11	78	207	0.0	0.0
K11	78	208	0.0	0.0
K11	78	209	0.0	0.0
K11	78	210	0.0	0.0
K11	78	211	0.3	0.0
K11	78	213	14.0	0.5
K11	78	214	0.0	0.0
K11	78	215	0.0	0.0
K11	78	216	0.0	0.0
K11	78	217	0.0	0.0
K11	78	218	0.0	0.0
K11	78	219	0.0	0.0
K11	78	220	0.0	0.0
K11	78	221	0.0	0.0
K11	78	222	0.0	0.0
K11	78	223	0.0	0.0
K11	78	224	0.0	0.0
K11	78	225	0.0	0.0
K11	78	226	0.0	0.0
K11	78	227	24.1	0.9
K11	78	228	0.0	0.0
K11	78	229	0.0	0.0
K11	78	230	0.0	0.0
K11	78	231	0.0	0.0
K11	78	232	0.0	0.0
K11	78	233	0.0	0.0
K11	78	234	0.0	0.0
K11	78	235	0.0	0.0
K11	78	236	0.0	0.0
K11	78	237	0.5	0.0
K11	78	238	0.3	0.0
K11	78	239	0.0	0.0
K11	78	240	0.0	0.0
K11	78	241	0.0	0.0
K11	78	242	0.0	0.0
K12	78	121	20.8	0.8
K12	78	122	7.4	0.3
K12	78	123	0.0	0.0
K12	78	124	0.0	0.0
K12	78	126	30.7	1.2
K12	78	127	2.5	0.1
K12	78	128	0.0	0.0
K12	78	129	0.0	0.0
K12	78	130	0.0	0.0
K12	78	131	0.0	0.0
K12	78	132	0.0	0.0
K12	78	133	0.0	0.0
K12	78	134	0.0	0.0
K12	78	135	0.0	0.0
K12	78	136	0.0	0.0
K12	78	137	0.0	0.0
K12	78	138	9.9	0.4
K12	78	139	0.0	0.0
K12	78	140	0.0	0.0
K12	78	141	0.0	0.0
K12	78	142	0.0	0.0
K12	78	143	0.0	0.0
K12	78	144	1.0	0.0
K12	78	145	0.0	0.0
K12	78	146	0.0	0.0
K12	78	147	0.0	0.0
K12	78	153	3.6	0.1
K12	78	154	1.5	0.1
K12	78	155	45.2	1.8
K12	78	156	0.0	0.0
K12	78	162	0.0	0.0
K12	78	163	0.0	0.0
K12	78	164	0.0	0.0
K12	78	165	0.0	0.0
K12	78	166	0.0	0.0
K12	78	167	0.0	0.0
K12	78	168	0.0	0.0
K12	78	169	1.5	0.1
K12	78	170	0.0	0.0
K12	78	171	2.5	0.1
K12	78	172	0.0	0.0
K12	78	173	0.0	0.0
K12	78	174	0.0	0.0
K12	78	175	0.0	0.0
K12	78	176	0.0	0.0
K12	78	177	0.0	0.0
K12	78	178	19.0	0.7
K12	78	179	5.6	0.2
K12	78	180	0.0	0.0
K12	78	182	1.3	0.0
K12	78	183	0.0	0.0
K12	78	184	0.0	0.0
K12	78	185	0.0	0.0
K12	78	186	0.0	0.0
K12	78	187	0.5	0.0
K12	78	188	0.0	0.0
K12	78	189	0.0	0.0
K12	78	190	0.0	0.0
K12	78	191	0.0	0.0
K12	78	192	0.0	0.0
K12	78	193	0.0	0.0
K12	78	194	0.0	0.0
K12	78	195	1.8	0.1
K12	78	196	0.0	0.0
K12	78	197	0.0	0.0
K12	78	198	0.0	0.0
K12	78	199	0.0	0.0
K12	78	200	0.0	0.0
K12	78	201	4.6	0.2
K12	78	202	13.2	0.5
K12	78	203	9.7	0.4
K12	78	204	0.0	0.0
K12	78	205	0.0	0.0
K12	78	206	0.0	0.0
K12	78	207	0.0	0.0
K12	78	208	0.0	0.0
K12	78	209	0.0	0.0
K12	78	210	0.0	0.0
K12	78	211	0.5	0.0
K12	78	213	7.0	0.3
K12	78	214	0.5	0.0
K12	78	215	0.0	0.0
K12	78	216	1.0	0.0
K12	78	217	0.0	0.0
K12	78	218	0.0	0.0
K12	78	219	0.0	0.0
K12	78	220	0.0	0.0
K12	78	221	0.0	0.0
K12	78	222	0.0	0.0
K12	78	223	0.0	0.0
K12	78	224	0.0	0.0
K12	78	225	0.0	0.0
K12	78	226	1.3	0.0
K12	78	227	21.6	0.8
K12	78	228	0.0	0.0
K12	78	229	0.0	0.0
K12	78	230	0.0	0.0
K12	78	231	0.0	0.0

TABLE 18.- Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K12	78	232	0.0	0.0
K12	78	233	0.0	0.0
K12	78	234	0.0	0.0
K12	78	235	0.0	0.0
K12	78	236	0.0	0.0
K12	78	237	0.5	0.0
K12	78	238	0.0	0.0
K12	78	239	0.0	0.0
K12	78	240	0.0	0.0
K12	78	241	0.0	0.0
K12	78	242	0.0	0.0
K13	78	121	16.5	0.6
K13	78	122	6.6	0.3
K13	78	123	0.0	0.0
K13	78	124	0.0	0.0
K13	78	126	28.7	1.1
K13	78	127	0.0	0.0
K13	78	128	0.0	0.0
K13	78	129	0.0	0.0
K13	78	130	0.0	0.0
K13	78	131	0.0	0.0
K13	78	132	0.0	0.0
K13	78	133	0.0	0.0
K13	78	134	0.0	0.0
K13	78	135	0.0	0.0
K13	78	136	0.0	0.0
K13	78	137	0.0	0.0
K13	78	138	15.2	0.6
K13	78	139	0.0	0.0
K13	78	140	0.0	0.0
K13	78	141	0.0	0.0
K13	78	142	0.0	0.0
K13	78	143	0.0	0.0
K13	78	144	3.0	0.1
K13	78	145	0.0	0.0
K13	78	146	0.0	0.0
K13	78	147	0.3	0.0
K13	78	153	3.8	0.1
K13	78	154	2.3	0.1
K13	78	155	59.9	2.4
K13	78	156	0.0	0.0
K13	78	157	9.1	0.4
K13	78	158	0.5	0.0
K13	78	159	0.0	0.0
K13	78	160	0.0	0.0
K13	78	161	0.0	0.0
K13	78	162	0.0	0.0
K13	78	163	0.0	0.0
K13	78	164	0.0	0.0
K13	78	165	0.0	0.0
K13	78	166	0.0	0.0
K13	78	167	0.0	0.0
K13	78	168	0.0	0.0
K13	78	169	2.0	0.1
K13	78	170	0.0	0.0
K13	78	171	3.0	0.1
K13	78	172	0.0	0.0
K13	78	173	0.0	0.0
K13	78	174	0.0	0.0
K13	78	175	0.0	0.0
K13	78	176	0.0	0.0
K13	78	177	0.0	0.0
K13	78	178	19.8	0.8
K13	78	179	3.3	0.1
K13	78	180	0.0	0.0
K13	78	182	2.8	0.1
K13	78	183	0.0	0.0
K13	78	184	0.0	0.0
K13	78	185	0.0	0.0
K13	78	186	0.0	0.0
K13	78	187	0.0	0.0
K13	78	188	0.0	0.0
K13	78	189	0.0	0.0
K13	78	190	0.0	0.0
K13	78	191	0.0	0.0
K13	78	192	0.0	0.0
K13	78	193	0.0	0.0
K13	78	194	0.0	0.0
K13	78	195	0.8	0.0

Rain gage number	Year	Day	Rainfall	
			mm	in.
K13	78	196	0.0	0.0
K13	78	197	3.8	0.1
K13	78	198	0.0	0.0
K13	78	199	0.0	0.0
K13	78	200	0.0	0.0
K13	78	201	5.1	0.2
K13	78	202	15.7	0.6
K13	78	203	16.8	0.7
K13	78	204	0.0	0.0
K13	78	205	0.0	0.0
K13	78	206	0.0	0.0
K13	78	207	0.0	0.0
K13	78	208	0.0	0.0
K13	78	209	0.0	0.0
K13	78	210	0.0	0.0
K13	78	211	1.3	0.0
K13	78	213	6.0	0.2
K13	78	214	3.3	0.1
K13	78	215	1.8	0.1
K13	78	216	1.0	0.0
K13	78	217	0.0	0.0
K13	78	218	0.0	0.0
K13	78	219	0.0	0.0
K13	78	220	0.0	0.0
K13	78	221	0.0	0.0
K13	78	222	0.0	0.0
K13	78	223	0.0	0.0
K13	78	224	0.0	0.0
K13	78	225	0.0	0.0
K13	78	226	1.0	0.0
K13	78	235	0.0	0.0
K13	78	236	0.0	0.0
K13	78	237	1.3	0.0
K13	78	238	2.3	0.1
K13	78	239	0.0	0.0
K13	78	240	0.0	0.0
K13	78	241	0.0	0.0
K13	78	242	0.0	0.0
K14	78	121	17.0	0.7
K14	78	122	4.8	0.2
K14	78	123	0.0	0.0
K14	78	124	0.0	0.0
K14	78	125	0.0	0.0
K14	78	126	26.7	1.0
K14	78	127	0.3	0.0
K14	78	128	0.0	0.0
K14	78	129	0.0	0.0
K14	78	130	0.0	0.0
K14	78	131	0.0	0.0
K14	78	132	0.0	0.0
K14	78	133	0.0	0.0
K14	78	134	0.0	0.0
K14	78	135	0.0	0.0
K14	78	137	0.0	0.0
K14	78	138	23.1	0.9
K14	78	139	0.0	0.0
K14	78	140	0.0	0.0
K14	78	141	0.0	0.0
K14	78	142	0.0	0.0
K14	78	143	0.0	0.0
K14	78	144	0.0	0.0
K14	78	145	0.0	0.0
K14	78	146	0.0	0.0
K14	78	147	0.3	0.0
K14	78	153	3.6	0.1
K14	78	154	0.3	0.0
K14	78	155	48.0	1.9
K14	78	156	0.0	0.0
K14	78	157	6.6	0.3
K14	78	158	0.0	0.0
K14	78	159	0.0	0.0
K14	78	160	0.0	0.0
K14	78	161	0.0	0.0
K14	78	162	0.0	0.0
K14	78	163	0.0	0.0
K14	78	164	0.0	0.0
K14	78	165	0.0	0.0
K14	78	166	0.0	0.0
K14	78	167	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K14	78	168	0.0	0.0
K14	78	169	1.5	0.1
K14	78	170	0.0	0.0
K14	78	171	3.0	0.1
K14	78	172	0.0	0.0
K14	78	173	0.0	0.0
K14	78	174	0.0	0.0
K14	78	175	0.0	0.0
K14	78	176	0.0	0.0
K14	78	177	0.0	0.0
K14	78	178	16.0	0.6
K14	78	179	0.8	0.0
K14	78	180	0.0	0.0
K14	78	182	0.0	0.0
K14	78	183	0.0	0.0
K14	78	184	0.3	0.0
K14	78	185	0.0	0.0
K14	78	186	0.0	0.0
K14	78	187	1.3	0.0
K14	78	188	0.0	0.0
K14	78	189	0.0	0.0
K14	78	190	0.0	0.0
K14	78	191	0.0	0.0
K14	78	192	0.0	0.0
K14	78	193	0.0	0.0
K14	78	194	0.0	0.0
K14	78	195	0.0	0.0
K14	78	196	0.0	0.0
K14	78	197	3.8	0.1
K14	78	198	0.0	0.0
K14	78	199	0.0	0.0
K14	78	200	0.0	0.0
K14	78	201	9.4	0.4
K14	78	202	18.8	0.7
K14	78	203	17.8	0.7
K14	78	204	0.0	0.0
K14	78	205	0.0	0.0
K14	78	206	0.0	0.0
K14	78	207	0.0	0.0
K14	78	208	0.0	0.0
K14	78	209	0.0	0.0
K14	78	210	0.0	0.0
K14	78	211	0.5	0.0
K14	78	213	0.8	0.0
K14	78	214	3.8	0.1
K14	78	215	0.3	0.0
K14	78	216	0.5	0.0
K14	78	217	0.0	0.0
K14	78	218	0.0	0.0
K14	78	221	0.0	0.0
K14	78	222	0.0	0.0
K14	78	223	0.0	0.0
K14	78	224	0.0	0.0
K14	78	225	0.0	0.0
K14	78	226	0.0	0.0
K14	78	227	14.7	0.6
K14	78	228	0.0	0.0
K14	78	229	0.0	0.0
K14	78	230	0.0	0.0
K14	78	231	0.0	0.0
K14	78	232	0.0	0.0
K14	78	233	0.0	0.0
K14	78	234	0.0	0.0
K14	78	235	0.0	0.0
K14	78	236	0.0	0.0
K14	78	237	0.0	0.0
K14	78	238	5.6	0.2
K14	78	239	0.0	0.0
K14	78	240	0.0	0.0
K14	78	241	0.0	0.0
K14	78	242	0.0	0.0
K15	78	121	19.0	0.7
K15	78	122	5.8	0.2
K15	78	123	0.0	0.0
K15	78	124	0.0	0.0
K15	78	125	0.0	0.0
K15	78	126	30.0	1.2
K15	78	127	1.3	0.0
K15	78	128	0.0	0.0
K15	78	129	0.0	0.0
K15	78	130	0.0	0.0
K15	78	131	0.0	0.0
K15	78	132	0.0	0.0
K15	78	133	0.0	0.0
K15	78	134	0.0	0.0
K15	78	135	0.0	0.0
K15	78	136	0.0	0.0
K15	78	137	0.0	0.0
K15	78	138	10.2	0.4
K15	78	139	0.0	0.0
K15	78	140	0.0	0.0
K15	78	141	0.0	0.0
K15	78	142	0.0	0.0
K15	78	143	0.0	0.0
K15	78	144	3.0	0.1
K15	78	145	0.0	0.0
K15	78	146	0.0	0.0
K15	78	147	0.3	0.0
K15	78	153	3.0	0.1
K15	78	154	0.0	0.0
K15	78	155	34.8	1.4
K15	78	156	0.0	0.0
K15	78	162	0.0	0.0
K15	78	163	0.0	0.0
K15	78	164	0.0	0.0
K15	78	165	0.0	0.0
K15	78	166	0.0	0.0
K15	78	167	0.0	0.0
K15	78	168	0.0	0.0
K15	78	169	0.8	0.0
K15	78	170	0.0	0.0
K15	78	171	1.3	0.0
K15	78	172	0.0	0.0
K15	78	173	0.0	0.0
K15	78	174	0.0	0.0
K15	78	175	0.0	0.0
K15	78	176	0.0	0.0
K15	78	177	0.0	0.0
K15	78	178	20.3	0.8
K15	78	179	6.3	0.2
K15	78	180	0.0	0.0
K15	78	182	0.0	0.0
K15	78	183	0.0	0.0
K15	78	184	0.0	0.0
K15	78	185	0.0	0.0
K15	78	186	0.0	0.0
K15	78	187	0.5	0.0
K15	78	188	0.0	0.0
K15	78	189	0.0	0.0
K15	78	190	1.0	0.0
K15	78	191	0.0	0.0
K15	78	192	0.0	0.0
K15	78	193	0.0	0.0
K15	78	194	0.0	0.0
K15	78	195	0.3	0.0
K15	78	196	0.0	0.0
K15	78	197	1.0	0.0
K15	78	198	0.0	0.0
K15	78	199	0.0	0.0
K15	78	200	0.0	0.0
K15	78	201	4.8	0.1
K15	78	202	17.0	0.7
K15	78	203	36.3	1.4
K15	78	204	0.0	0.0
K15	78	205	0.0	0.0
K15	78	206	0.0	0.0
K15	78	207	0.0	0.0
K15	78	208	0.0	0.0
K15	78	209	0.0	0.0
K15	78	210	0.0	0.0
K15	78	211	0.8	0.0
K15	78	213	10.0	0.4
K15	78	214	4.1	0.2
K15	78	215	0.0	0.0
K15	78	216	0.5	0.0
K15	78	217	0.0	0.0
K15	78	220	0.0	0.0
K15	78	221	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K15	78	224	0.0	0.0
K15	78	225	0.0	0.0
K15	78	226	0.8	0.0
K15	78	235	0.0	0.0
K15	78	236	0.0	0.0
K15	78	237	0.0	0.0
K15	78	238	0.5	0.0
K15	78	239	0.0	0.0
K15	78	240	0.0	0.0
K15	78	241	0.0	0.0
K15	78	242	0.0	0.0
K16	78	121	19.0	0.7
K16	78	122	6.6	0.3
K16	78	123	0.0	0.0
K16	78	124	0.0	0.0
K16	78	125	0.0	0.0
K16	78	126	32.0	1.3
K16	78	127	1.5	0.1
K16	78	128	0.0	0.0
K16	78	129	0.0	0.0
K16	78	130	0.0	0.0
K16	78	131	0.0	0.0
K16	78	132	0.0	0.0
K16	78	133	0.0	0.0
K16	78	134	0.0	0.0
K16	78	135	0.0	0.0
K16	78	136	0.0	0.0
K16	78	137	0.0	0.0
K16	78	138	11.4	0.4
K16	78	139	0.0	0.0
K16	78	140	0.0	0.0
K16	78	141	0.0	0.0
K16	78	142	1.0	0.0
K16	78	143	0.0	0.0
K16	78	144	3.0	0.1
K16	78	145	0.0	0.0
K16	78	146	0.0	0.0
K16	78	147	1.5	0.1
K16	78	153	3.3	0.1
K16	78	154	0.0	0.0
K16	78	155	40.9	1.6
K16	78	156	0.0	0.0
K16	78	157	18.0	0.7
K16	78	158	0.0	0.0
K16	78	159	0.0	0.0
K16	78	160	0.0	0.0
K16	78	161	0.0	0.0
K16	78	162	0.0	0.0
K16	78	163	0.0	0.0
K16	78	164	0.0	0.0
K16	78	165	0.0	0.0
K16	78	166	0.0	0.0
K16	78	167	0.0	0.0
K16	78	168	0.0	0.0
K16	78	169	1.8	0.1
K16	78	170	0.0	0.0
K16	78	171	2.3	0.1
K16	78	172	0.0	0.0
K16	78	173	0.0	0.0
K16	78	174	0.0	0.0
K16	78	175	0.0	0.0
K16	78	176	0.0	0.0
K16	78	177	0.0	0.0
K16	78	178	16.3	0.6
K16	78	179	3.8	0.1
K16	78	180	0.0	0.0
K16	78	182	0.8	0.0
K16	78	183	0.0	0.0
K16	78	184	1.0	0.0
K16	78	185	0.0	0.0
K16	78	186	0.0	0.0
K16	78	187	0.3	0.0
K16	78	188	0.0	0.0
K16	78	189	0.0	0.0
K16	78	190	0.3	0.0
K16	78	191	0.0	0.0
K16	78	192	0.0	0.0
K16	78	193	0.0	0.0
K16	78	194	0.0	0.0
K16	78	195	0.5	0.0
K16	78	196	0.0	0.0
K16	78	197	1.0	0.0
K16	78	198	0.0	0.0
K16	78	199	0.0	0.0
K16	78	200	0.0	0.0
K16	78	201	9.1	0.4
K16	78	202	16.8	0.7
K16	78	203	50.8	2.0
K16	78	204	0.0	0.0
K16	78	205	0.0	0.0
K16	78	206	0.0	0.0
K16	78	207	0.0	0.0
K16	78	208	0.0	0.0
K16	78	209	0.0	0.0
K16	78	210	0.0	0.0
K16	78	211	0.5	0.0
K16	78	213	3.0	0.1
K16	78	214	3.6	0.1
K16	78	215	1.3	0.0
K16	78	216	2.0	0.1
K16	78	217	0.0	0.0
K16	78	218	0.0	0.0
K16	78	219	0.0	0.0
K16	78	220	0.0	0.0
K16	78	221	0.0	0.0
K16	78	222	0.0	0.0
K16	78	223	0.0	0.0
K16	78	224	0.0	0.0
K16	78	225	0.0	0.0
K16	78	226	0.5	0.0
K16	78	227	20.8	0.8
K16	78	228	0.0	0.0
K16	78	229	0.0	0.0
K16	78	230	0.0	0.0
K16	78	231	0.0	0.0
K16	78	232	0.0	0.0
K16	78	233	0.0	0.0
K16	78	234	0.0	0.0
K16	78	235	0.0	0.0
K16	78	236	0.0	0.0
K16	78	237	0.8	0.0
K16	78	238	4.3	0.2
K16	78	239	0.0	0.0
K16	78	240	0.5	0.0
K16	78	241	0.0	0.0
K16	78	242	0.0	0.0
K17	78	121	16.5	0.6
K17	78	122	6.1	0.2
K17	78	123	0.0	0.0
K17	78	124	0.0	0.0
K17	78	125	0.0	0.0
K17	78	126	30.2	1.2
K17	78	127	1.8	0.1
K17	78	130	0.0	0.0
K17	78	131	0.0	0.0
K17	78	132	0.0	0.0
K17	78	133	0.0	0.0
K17	78	135	0.0	0.0
K17	78	136	0.0	0.0
K17	78	137	0.0	0.0
K17	78	138	12.2	0.5
K17	78	139	0.0	0.0
K17	78	140	0.0	0.0
K17	78	141	0.0	0.0
K17	78	142	0.0	0.0
K17	78	143	0.0	0.0
K17	78	144	1.8	0.1
K17	78	145	0.0	0.0
K17	78	146	0.0	0.0
K17	78	147	0.0	0.0
K17	78	153	1.5	0.1
K17	78	154	0.0	0.0
K17	78	155	37.6	1.5
K17	78	156	0.0	0.0
K17	78	157	19.8	0.8
K17	78	158	0.3	0.0
K17	78	159	0.0	0.0
K17	78	160	0.0	0.0

TABLE 18.— Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K17	78	161	0.0	0.0
K17	78	162	0.0	0.0
K17	78	163	0.0	0.0
K17	78	164	0.0	0.0
K17	78	165	0.0	0.0
K17	78	166	0.0	0.0
K17	78	167	0.0	0.0
K17	78	168	0.0	0.0
K17	78	169	1.3	0.0
K17	78	170	0.0	0.0
K17	78	171	1.8	0.1
K17	78	172	0.0	0.0
K17	78	173	0.0	0.0
K17	78	174	0.0	0.0
K17	78	175	0.0	0.0
K17	78	176	0.0	0.0
K17	78	177	0.0	0.0
K17	78	178	15.2	0.6
K17	78	179	10.7	0.4
K17	78	180	0.0	0.0
K17	78	182	2.8	0.1
K17	78	183	0.0	0.0
K17	78	184	0.0	0.0
K17	78	185	0.0	0.0
K17	78	186	0.0	0.0
K17	78	187	0.5	0.0
K17	78	188	0.0	0.0
K17	78	189	0.0	0.0
K17	78	190	0.8	0.0
K17	78	191	0.0	0.0
K17	78	192	0.0	0.0
K17	78	193	0.0	0.0
K17	78	194	0.0	0.0
K17	78	195	0.0	0.0
K17	78	196	0.0	0.0
K17	78	197	0.0	0.0
K17	78	198	0.0	0.0
K17	78	199	0.0	0.0
K17	78	200	0.0	0.0
K17	78	201	6.3	0.2
K17	78	202	16.0	0.6
K17	78	203	22.9	0.9
K17	78	204	0.0	0.0
K17	78	205	0.0	0.0
K17	78	206	0.0	0.0
K17	78	207	0.0	0.0
K17	78	208	0.0	0.0
K17	78	209	0.0	0.0
K17	78	210	0.0	0.0
K17	78	211	0.0	0.0
K17	78	213	3.3	0.1
K17	78	214	17.5	0.7
K17	78	215	0.0	0.0
K17	78	216	0.3	0.0
K17	78	217	0.0	0.0
K17	78	218	0.0	0.0
K17	78	219	0.0	0.0
K17	78	220	0.0	0.0
K17	78	221	0.0	0.0
K17	78	222	0.0	0.0
K17	78	223	0.0	0.0
K17	78	224	0.0	0.0
K17	78	225	0.0	0.0
K17	78	226	1.0	0.0
K17	78	227	11.9	0.5
K17	78	228	0.0	0.0
K17	78	229	0.0	0.0
K17	78	230	0.0	0.0
K17	78	231	0.0	0.0
K17	78	232	0.0	0.0
K17	78	233	0.0	0.0
K17	78	234	0.0	0.0
K17	78	235	0.0	0.0
K17	78	236	0.0	0.0
K17	78	237	0.0	0.0
K17	78	238	0.8	0.0
K17	78	239	0.0	0.0
K17	78	240	0.0	0.0
K17	78	241	0.0	0.0

Rain gage number	Year	Day	Rainfall	
			mm	in.
K17	78	242	0.0	0.0
K18	78	121	19.0	0.7
K18	78	122	6.6	0.3
K18	78	123	0.0	0.0
K18	78	124	0.0	0.0
K18	78	125	0.0	0.0
K18	78	126	28.2	1.1
K18	78	127	1.5	0.1
K18	78	128	0.0	0.0
K18	78	129	0.0	0.0
K18	78	130	0.0	0.0
K18	78	131	0.0	0.0
K18	78	132	0.0	0.0
K18	78	133	0.0	0.0
K18	78	134	0.0	0.0
K18	78	135	0.0	0.0
K18	78	136	0.0	0.0
K18	78	137	0.0	0.0
K18	78	138	19.0	0.7
K18	78	139	0.0	0.0
K18	78	140	0.0	0.0
K18	78	141	0.0	0.0
K18	78	142	0.0	0.0
K18	78	143	0.0	0.0
K18	78	144	0.0	0.0
K18	78	145	0.0	0.0
K18	78	146	0.0	0.0
K18	78	147	0.0	0.0
K18	78	148	1.5	0.1
K18	78	149	0.0	0.0
K18	78	150	0.0	0.0
K18	78	152	0.0	0.0
K18	78	153	1.0	0.0
K18	78	154	0.0	0.0
K18	78	155	58.4	2.3
K18	78	156	0.0	0.0
K18	78	157	47.2	1.9
K18	78	158	0.0	0.0
K18	78	160	0.0	0.0
K18	78	161	0.0	0.0
K18	78	162	0.0	0.0
K18	78	163	0.0	0.0
K18	78	164	0.0	0.0
K18	78	165	0.0	0.0
K18	78	166	0.0	0.0
K18	78	167	0.0	0.0
K18	78	168	0.0	0.0
K18	78	169	0.5	0.0
K18	78	170	0.0	0.0
K18	78	171	0.0	0.0
K18	78	172	0.0	0.0
K18	78	173	0.0	0.0
K18	78	174	0.0	0.0
K18	78	175	0.0	0.0
K18	78	176	0.0	0.0
K18	78	177	0.0	0.0
K18	78	178	8.6	0.3
K18	78	179	1.5	0.1
K18	78	180	0.0	0.0
K18	78	182	0.0	0.0
K18	78	183	0.0	0.0
K18	78	184	0.0	0.0
K18	78	185	0.0	0.0
K18	78	186	0.0	0.0
K18	78	187	0.0	0.0
K18	78	188	0.0	0.0
K18	78	189	0.0	0.0
K18	78	190	0.0	0.0
K18	78	191	0.0	0.0
K18	78	192	0.0	0.0
K18	78	193	0.0	0.0
K18	78	194	0.0	0.0
K18	78	195	0.3	0.0
K18	78	196	0.0	0.0
K18	78	197	0.0	0.0
K18	78	198	0.0	0.0
K18	78	199	0.0	0.0
K18	78	200	0.0	0.0
K18	78	201	18.0	0.7

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall mm	Rainfall in.
K18	78	202	14.7	0.6
K18	78	203	4.8	0.2
K18	78	204	0.0	0.0
K18	78	205	0.0	0.0
K18	78	206	0.0	0.0
K18	78	207	0.0	0.0
K18	78	208	0.0	0.0
K18	78	209	0.0	0.0
K18	78	210	0.0	0.0
K18	78	211	1.5	0.1
K18	78	213	1.8	0.1
K18	78	214	6.9	0.3
K18	78	215	1.3	0.0
K18	78	216	1.0	0.0
K18	78	217	0.0	0.0
K18	78	218	0.0	0.0
K18	78	219	0.0	0.0
K18	78	220	0.0	0.0
K18	78	221	0.0	0.0
K18	78	222	0.0	0.0
K18	78	223	0.0	0.0
K18	78	224	0.0	0.0
K18	78	225	0.0	0.0
K18	78	226	2.0	0.1
K18	78	227	10.9	0.4
K18	78	228	0.0	0.0
K18	78	229	0.0	0.0
K18	78	230	0.0	0.0
K18	78	231	0.0	0.0
K18	78	232	0.0	0.0
K18	78	233	0.0	0.0
K18	78	234	0.0	0.0
K18	78	235	0.0	0.0
K18	78	236	0.0	0.0
K18	78	237	0.0	0.0
K18	78	238	1.0	0.0
K18	78	239	0.0	0.0
K18	78	240	0.0	0.0
K18	78	241	0.0	0.0
K19	78	121	21.6	0.8
K19	78	122	7.4	0.3
K19	78	123	0.0	0.0
K19	78	124	0.0	0.0
K19	78	125	0.0	0.0
K19	78	126	30.0	1.2
K19	78	127	1.5	0.1
K19	78	128	0.0	0.0
K19	78	129	0.0	0.0
K19	78	130	0.0	0.0
K19	78	131	0.0	0.0
K19	78	132	0.3	0.0
K19	78	133	0.0	0.0
K19	78	134	0.0	0.0
K19	78	135	0.0	0.0
K19	78	136	0.0	0.0
K19	78	137	0.0	0.0
K19	78	138	19.0	0.7
K19	78	139	0.0	0.0
K19	78	140	0.0	0.0
K19	78	141	0.0	0.0
K19	78	142	0.0	0.0
K19	78	143	0.0	0.0
K19	78	144	0.0	0.0
K19	78	145	0.0	0.0
K19	78	146	0.0	0.0
K19	78	147	0.0	0.0
K19	78	148	11.4	0.4
K19	78	149	0.0	0.0
K19	78	150	0.0	0.0
K19	78	152	0.0	0.0
K19	78	153	0.5	0.0
K19	78	154	0.0	0.0
K19	78	155	70.6	2.8
K19	78	156	0.0	0.0
K19	78	157	19.8	0.8
K19	78	158	0.3	0.0
K19	78	159	0.0	0.0
K19	78	160	0.0	0.0
K19	78	161	0.0	0.0
K19	78	162	0.0	0.0
K19	78	163	0.0	0.0
K19	78	164	0.0	0.0
K19	78	165	0.0	0.0
K19	78	166	0.0	0.0
K19	78	167	0.0	0.0
K19	78	168	0.0	0.0
K19	78	169	0.5	0.0
K19	78	170	0.0	0.0
K19	78	171	0.0	0.0
K19	78	172	0.0	0.0
K19	78	173	0.0	0.0
K19	78	174	0.0	0.0
K19	78	175	0.0	0.0
K19	78	176	0.0	0.0
K19	78	177	0.0	0.0
K19	78	178	8.1	0.3
K19	78	179	8.9	0.3
K19	78	180	0.0	0.0
K19	78	182	2.0	0.1
K19	78	183	0.0	0.0
K19	78	184	0.0	0.0
K19	78	185	0.0	0.0
K19	78	186	1.0	0.0
K19	78	187	0.0	0.0
K19	78	188	0.0	0.0
K19	78	189	0.0	0.0
K19	78	190	0.0	0.0
K19	78	191	0.0	0.0
K19	78	192	0.0	0.0
K19	78	193	0.0	0.0
K19	78	194	0.0	0.0
K19	78	195	0.0	0.0
K19	78	196	0.0	0.0
K19	78	197	0.0	0.0
K19	78	198	0.0	0.0
K19	78	208	0.0	0.0
K19	78	209	0.0	0.0
K19	78	210	0.0	0.0
K19	78	211	1.5	0.1
K19	78	213	0.0	0.0
K20	78	121	22.4	0.9
K20	78	122	6.9	0.3
K20	78	123	0.0	0.0
K20	78	124	0.0	0.0
K20	78	125	0.0	0.0
K20	78	126	30.2	1.2
K20	78	127	0.3	0.0
K20	78	128	0.0	0.0
K20	78	129	0.0	0.0
K20	78	130	0.0	0.0
K20	78	131	0.0	0.0
K20	78	132	0.0	0.0
K20	78	133	0.0	0.0
K20	78	134	0.0	0.0
K20	78	135	0.0	0.0
K20	78	136	0.0	0.0
K20	78	137	0.0	0.0
K20	78	138	22.4	0.9
K20	78	140	0.0	0.0
K20	78	141	0.0	0.0
K20	78	142	0.0	0.0
K20	78	143	0.0	0.0
K20	78	144	0.0	0.0
K20	78	145	0.0	0.0
K20	78	146	0.0	0.0
K20	78	147	0.0	0.0
K20	78	148	2.3	0.1
K20	78	149	0.0	0.0
K20	78	150	0.0	0.0
K20	78	152	0.0	0.0
K20	78	153	0.5	0.0
K20	78	154	0.0	0.0
K20	78	155	54.4	2.1
K20	78	156	0.0	0.0
K20	78	157	32.8	1.3
K20	78	158	0.0	0.0
K20	78	159	0.0	0.0
K20	78	160	0.0	0.0

TABLE 18.— Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K20	78	161	0.0	0.0
K20	78	162	0.0	0.0
K20	78	163	0.0	0.0
K20	78	164	0.0	0.0
K20	78	165	0.0	0.0
K20	78	166	0.0	0.0
K20	78	167	0.0	0.0
K20	78	168	0.0	0.0
K20	78	169	1.3	0.0
K20	78	170	0.0	0.0
K20	78	171	0.5	0.0
K20	78	172	0.0	0.0
K20	78	173	0.0	0.0
K20	78	174	0.0	0.0
K20	78	175	0.0	0.0
K20	78	176	0.0	0.0
K20	78	177	0.0	0.0
K20	78	178	9.7	0.4
K20	78	179	1.5	0.1
K20	78	180	0.0	0.0
K20	78	182	1.0	0.0
K20	78	183	0.0	0.0
K20	78	184	0.3	0.0
K20	78	185	0.0	0.0
K20	78	186	0.0	0.0
K20	78	187	0.0	0.0
K20	78	188	0.0	0.0
K20	78	189	0.0	0.0
K20	78	190	0.0	0.0
K20	78	191	0.0	0.0
K20	78	192	0.0	0.0
K20	78	193	0.0	0.0
K20	78	194	0.0	0.0
K20	78	195	0.0	0.0
K20	78	196	0.0	0.0
K20	78	197	0.0	0.0
K20	78	198	0.0	0.0
K20	78	199	0.0	0.0
K20	78	200	0.0	0.0
K20	78	201	21.3	0.8
K20	78	202	14.2	0.6
K20	78	203	6.1	0.2
K20	78	204	0.0	0.0
K20	78	205	0.0	0.0
K20	78	206	0.0	0.0
K20	78	207	0.0	0.0
K20	78	208	0.0	0.0
K20	78	209	0.0	0.0
K20	78	210	0.0	0.0
K20	78	211	0.8	0.0
K20	78	213	0.0	0.0
K20	78	214	0.8	0.0
K20	78	215	0.8	0.0
K20	78	216	1.0	0.0
K20	78	217	0.0	0.0
K20	78	218	0.0	0.0
K20	78	219	0.0	0.0
K20	78	220	0.0	0.0
K20	78	221	0.0	0.0
K20	78	222	0.0	0.0
K20	78	223	0.0	0.0
K20	78	224	0.0	0.0
K20	78	225	0.0	0.0
K20	78	226	0.0	0.0
K20	78	227	6.6	0.3
K20	78	228	0.0	0.0
K20	78	229	0.0	0.0
K20	78	230	0.0	0.0
K20	78	231	0.0	0.0
K20	78	232	0.0	0.0
K20	78	233	0.0	0.0
K20	78	234	0.0	0.0
K20	78	235	0.0	0.0
K20	78	236	0.0	0.0
K20	78	237	0.0	0.0
K20	78	238	1.5	0.1
K20	78	239	0.0	0.0
K20	78	240	0.3	0.0
K20	78	241	0.0	0.0

Rain gage number	Year	Day	Rainfall	
			mm	in.
K21	78	121	22.6	0.9
K21	78	122	6.3	0.2
K21	78	123	0.0	0.0
K21	78	142	0.0	0.0
K21	78	143	0.0	0.0
K21	78	144	0.0	0.0
K21	78	153	2.3	0.1
K21	78	154	0.0	0.0
K21	78	155	75.9	3.0
K21	78	156	0.0	0.0
K21	78	157	16.3	0.6
K21	78	158	0.0	0.0
K21	78	159	0.0	0.0
K21	78	160	0.0	0.0
K21	78	161	0.0	0.0
K21	78	162	0.0	0.0
K21	78	163	0.0	0.0
K21	78	164	0.0	0.0
K21	78	165	0.0	0.0
K21	78	166	0.0	0.0
K21	78	167	0.0	0.0
K21	78	168	0.0	0.0
K21	78	169	1.0	0.0
K21	78	170	0.0	0.0
K21	78	171	0.3	0.0
K21	78	172	0.0	0.0
K21	78	173	0.0	0.0
K21	78	174	0.0	0.0
K21	78	175	0.0	0.0
K21	78	176	0.0	0.0
K21	78	177	0.0	0.0
K21	78	178	12.7	0.5
K21	78	179	16.5	0.6
K21	78	180	0.0	0.0
K21	78	182	0.8	0.0
K21	78	183	0.0	0.0
K21	78	184	0.0	0.0
K21	78	185	0.0	0.0
K21	78	186	0.0	0.0
K21	78	187	0.0	0.0
K21	78	188	0.0	0.0
K21	78	189	0.0	0.0
K21	78	190	0.0	0.0
K21	78	191	0.0	0.0
K21	78	192	0.0	0.0
K21	78	193	0.0	0.0
K21	78	194	0.0	0.0
K21	78	195	0.0	0.0
K21	78	196	0.0	0.0
K21	78	197	6.1	0.2
K21	78	198	0.0	0.0
K21	78	199	0.0	0.0
K21	78	200	0.0	0.0
K21	78	201	22.9	0.9
K21	78	202	3.3	0.1
K21	78	203	5.3	0.2
K21	78	204	0.5	0.0
K21	78	205	0.0	0.0
K21	78	206	0.0	0.0
K21	78	207	0.0	0.0
K21	78	208	0.0	0.0
K21	78	209	0.0	0.0
K21	78	210	0.0	0.0
K21	78	211	1.3	0.0
K21	78	213	0.0	0.0
K22	78	121	21.1	0.8
K22	78	122	4.6	0.2
K22	78	123	0.0	0.0
K22	78	124	0.0	0.0
K22	78	125	0.0	0.0
K22	78	126	31.7	1.2
K22	78	127	1.0	0.0
K22	78	128	0.0	0.0
K22	78	129	0.0	0.0
K22	78	130	0.0	0.0
K22	78	131	0.0	0.0
K22	78	132	0.0	0.0
K22	78	133	0.0	0.0
K22	78	134	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall mm	Rainfall in.
K22	78	135	0.0	0.0
K22	78	136	0.0	0.0
K22	78	137	0.0	0.0
K22	78	138	17.3	0.7
K22	78	139	0.0	0.0
K22	78	140	0.0	0.0
K22	78	142	0.0	0.0
K22	78	143	0.0	0.0
K22	78	144	0.0	0.0
K22	78	153	1.8	0.1
K22	78	154	0.0	0.0
K22	78	155	61.5	2.4
K22	78	156	0.0	0.0
K22	78	157	23.9	0.9
K22	78	158	0.0	0.0
K22	78	159	0.0	0.0
K22	78	160	0.0	0.0
K22	78	161	0.0	0.0
K22	78	162	0.0	0.0
K22	78	163	0.0	0.0
K22	78	164	0.0	0.0
K22	78	165	0.0	0.0
K22	78	166	0.0	0.0
K22	78	167	0.0	0.0
K22	78	168	0.0	0.0
K22	78	169	1.5	0.1
K22	78	170	0.0	0.0
K22	78	171	0.3	0.0
K22	78	172	0.5	0.0
K22	78	173	0.0	0.0
K22	78	174	0.0	0.0
K22	78	175	0.0	0.0
K22	78	176	0.0	0.0
K22	78	177	0.0	0.0
K22	78	178	14.0	0.5
K22	78	179	0.0	0.0
K22	78	180	0.0	0.0
K22	78	182	0.8	0.0
K22	78	183	0.0	0.0
K22	78	184	0.0	0.0
K22	78	185	0.0	0.0
K22	78	186	0.0	0.0
K22	78	187	0.0	0.0
K22	78	188	0.0	0.0
K22	78	189	0.0	0.0
K22	78	190	2.0	0.1
K22	78	191	0.0	0.0
K22	78	192	0.0	0.0
K22	78	193	0.0	0.0
K22	78	194	0.0	0.0
K22	78	195	0.8	0.0
K22	78	196	0.0	0.0
K22	78	197	0.8	0.0
K22	78	196	0.0	0.0
K22	78	199	0.0	0.0
K22	78	200	0.0	0.0
K22	78	207	0.0	0.0
K22	78	208	0.0	0.0
K22	79	209	0.0	0.0
K22	78	210	0.0	0.0
	0	0	0.0	0.0
K23	78	121	18.8	0.7
K23	78	122	4.8	0.2
K23	78	123	0.0	0.0
K23	78	124	0.0	0.0
K23	78	125	0.0	0.0
K23	78	126	30.0	1.2
K23	78	127	0.8	0.0
K23	78	128	0.0	0.0
K23	78	129	0.0	0.0
K23	78	130	0.0	0.0
K23	78	131	0.0	0.0
K23	78	132	0.0	0.0
K23	78	133	0.0	0.0
K23	78	134	0.0	0.0
K23	78	135	0.0	0.0
K23	78	136	0.0	0.0
K23	78	137	0.0	0.0
K23	78	138	33.8	1.3

Rain gage number	Year	Day	Rainfall mm	Rainfall in.
K23	78	139	0.0	0.0
K23	78	140	0.0	0.0
K23	78	141	0.0	0.0
K23	78	142	0.0	0.0
K23	78	143	0.0	0.0
K23	78	144	0.0	0.0
K23	78	153	2.8	0.1
K23	78	154	0.0	0.0
K23	78	155	63.2	2.5
K23	78	156	0.0	0.0
K23	78	157	21.3	0.8
K23	78	158	0.0	0.0
K23	78	159	0.0	0.0
K23	78	160	0.0	0.0
K23	78	161	0.0	0.0
K23	78	162	0.0	0.0
K23	78	163	0.0	0.0
K23	78	164	0.0	0.0
K23	78	165	0.0	0.0
K23	78	166	0.0	0.0
K23	78	167	0.0	0.0
K23	78	168	0.0	0.0
K23	78	169	2.0	0.1
K23	78	170	0.0	0.0
K23	78	171	0.5	0.0
K23	78	172	0.3	0.0
K23	78	173	0.0	0.0
K23	78	174	0.0	0.0
K23	78	175	0.0	0.0
K23	78	176	0.0	0.0
K23	78	177	0.0	0.0
K23	78	178	13.7	0.5
K23	78	179	0.5	0.0
K23	78	180	0.0	0.0
K23	78	182	0.0	0.0
K23	78	183	0.0	0.0
K23	78	184	0.0	0.0
K23	78	185	0.0	0.0
K23	78	186	0.0	0.0
K23	78	187	0.0	0.0
K23	78	188	0.0	0.0
K23	78	189	0.0	0.0
K23	78	190	0.0	0.0
K23	78	191	0.0	0.0
K23	78	192	0.0	0.0
K23	78	193	0.0	0.0
K23	78	194	0.0	0.0
K23	78	195	0.5	0.0
K23	78	196	0.0	0.0
K23	78	197	2.3	0.1
K23	78	198	0.0	0.0
K23	78	199	0.0	0.0
K23	78	200	0.0	0.0
K23	78	201	24.6	1.0
K23	78	202	9.7	0.4
K23	78	203	10.2	0.4
K23	78	204	0.0	0.0
K23	78	205	0.0	0.0
K23	78	206	0.0	0.0
K23	78	207	0.0	0.0
K23	78	208	0.0	0.0
K23	78	209	0.0	0.0
K23	78	210	0.0	0.0
K23	78	211	1.3	0.0
K24	78	121	22.4	0.9
K24	78	122	4.8	0.2
K24	78	123	0.0	0.0
K24	78	124	0.0	0.0
K24	78	125	0.0	0.0
K24	78	126	29.7	1.2
K24	78	127	1.5	0.1
K24	78	128	0.0	0.0
K24	78	129	0.0	0.0
K24	78	130	0.0	0.0
K24	78	131	0.0	0.0
K24	78	132	0.0	0.0
K24	78	133	0.0	0.0
K24	78	134	0.0	0.0
K24	78	135	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall mm	Rainfall in.
K24	78	136	0.0	0.0
K24	78	137	0.0	0.0
K24	78	138	10.7	0.4
K24	78	139	0.0	0.0
K24	78	140	0.0	0.0
K24	78	141	0.0	0.0
K24	78	142	0.0	0.0
K24	78	143	0.0	0.0
K24	78	144	0.0	0.0
K24	78	145	0.0	0.0
K24	78	146	0.0	0.0
K24	78	147	0.3	0.0
K24	78	148	1.3	0.0
K24	78	149	0.0	0.0
K24	78	150	0.0	0.0
K24	78	152	0.0	0.0
K24	78	153	3.0	0.1
K24	78	154	0.0	0.0
K24	78	155	65.3	2.6
K24	78	156	0.0	0.0
K24	78	157	21.6	0.8
K24	78	158	0.0	0.0
K24	78	159	0.0	0.0
K24	78	160	0.0	0.0
K24	78	161	0.0	0.0
K24	78	162	0.0	0.0
K24	78	163	0.0	0.0
K24	78	164	0.0	0.0
K24	78	165	0.0	0.0
K24	78	166	0.0	0.0
K24	78	167	0.0	0.0
K24	78	168	0.0	0.0
K24	78	169	1.5	0.1
K24	78	170	0.0	0.0
K24	78	171	1.3	0.0
K24	78	172	0.0	0.0
K24	78	173	0.0	0.0
K24	78	174	0.0	0.0
K24	78	175	0.0	0.0
K24	78	176	0.0	0.0
K24	78	177	0.0	0.0
K24	78	178	13.0	0.5
K24	78	179	0.5	0.0
K24	78	180	0.0	0.0
K24	78	182	0.0	0.0
K24	78	183	0.0	0.0
K24	78	184	0.0	0.0
K24	78	185	0.0	0.0
K24	78	186	0.0	0.0
K24	78	187	0.0	0.0
K24	78	188	0.0	0.0
K24	78	189	0.0	0.0
K24	78	190	0.0	0.0
K24	78	191	0.0	0.0
K24	78	192	0.0	0.0
K24	78	193	0.0	0.0
K24	78	194	0.0	0.0
K24	78	195	1.0	0.0
K24	78	196	0.0	0.0
K24	78	197	7.4	0.3
K24	78	198	0.0	0.0
K24	78	199	0.0	0.0
K24	78	200	0.0	0.0
K24	78	201	19.6	0.8
K24	78	202	5.8	0.2
K24	78	203	21.6	0.8
K24	78	204	0.0	0.0
K24	78	205	0.0	0.0
K24	78	206	0.0	0.0
K24	78	207	0.0	0.0
K24	78	208	0.0	0.0
K24	78	209	0.0	0.0
K24	78	210	0.0	0.0
K24	78	211	1.0	0.0
K24	78	213	0.0	0.0
K24	78	214	1.0	0.0
K24	78	215	1.0	0.0
K24	78	216	0.8	0.0
K24	78	217	0.0	0.0
K24	78	218	0.0	0.0
K24	78	219	0.0	0.0
K24	78	220	0.0	0.0
K24	78	221	0.0	0.0
K24	78	222	0.0	0.0
K24	78	223	0.0	0.0
K24	78	224	0.0	0.0
K24	78	228	0.0	0.0
K24	78	229	0.0	0.0
K24	78	230	0.0	0.0
K24	78	231	0.0	0.0
K24	78	232	0.0	0.0
K24	78	233	0.0	0.0
K24	78	234	0.0	0.0
K24	78	235	0.0	0.0
K24	78	236	0.0	0.0
K24	78	237	0.0	0.0
K24	78	238	1.0	0.0
K24	78	239	0.0	0.0
K24	78	240	0.5	0.0
K24	78	241	0.0	0.0
K25	78	121	20.3	0.8
K25	78	122	5.8	0.2
K25	78	123	0.0	0.0
K25	78	124	0.0	0.0
K25	78	125	0.0	0.0
K25	78	126	32.5	1.3
K25	78	127	1.0	0.0
K25	78	128	0.0	0.0
K25	78	129	0.0	0.0
K25	78	130	0.0	0.0
K25	78	131	0.0	0.0
K25	78	132	0.3	0.0
K25	78	133	0.0	0.0
K25	78	134	0.0	0.0
K25	78	135	0.0	0.0
K25	78	136	0.0	0.0
K25	78	137	0.0	0.0
K25	78	138	14.7	0.6
K25	78	140	0.0	0.0
K25	78	141	0.0	0.0
K25	78	142	0.0	0.0
K25	78	143	0.0	0.0
K25	78	144	0.0	0.0
K25	78	145	0.0	0.0
K25	78	146	0.0	0.0
K25	78	147	0.0	0.0
K25	78	148	0.5	0.0
K25	78	149	0.0	0.0
K25	78	150	0.0	0.0
K25	78	152	0.0	0.0
K25	78	153	1.5	0.1
K25	78	154	2.5	0.1
K25	78	155	66.0	2.6
K25	78	156	0.0	0.0
K25	78	157	17.3	0.7
K25	78	158	0.0	0.0
K25	78	159	0.0	0.0
K25	78	160	0.0	0.0
K25	78	161	0.0	0.0
K25	78	162	0.0	0.0
K25	78	163	0.0	0.0
K25	78	164	0.0	0.0
K25	78	165	0.0	0.0
K25	78	166	0.0	0.0
K25	78	167	0.0	0.0
K25	78	168	0.0	0.0
K25	78	169	1.3	0.0
K25	78	170	0.0	0.0
K25	78	171	5.1	0.2
K25	78	172	0.0	0.0
K25	78	173	0.0	0.0
K25	78	174	0.0	0.0
K25	78	175	0.0	0.0
K25	78	176	0.0	0.0
K25	78	177	0.0	0.0
K25	78	178	13.2	0.5
K25	78	179	2.0	0.1
K25	78	180	0.0	0.0

TABLE 18.— Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K25	78	182	0.0	0.0
K25	78	183	0.0	0.0
K25	78	184	0.3	0.0
K25	78	185	0.0	0.0
K25	78	186	0.0	0.0
K25	78	187	0.0	0.0
K25	78	188	0.0	0.0
K25	78	189	0.0	0.0
K25	78	190	0.0	0.0
K25	78	191	0.0	0.0
K25	78	192	0.0	0.0
K25	78	193	0.0	0.0
K25	78	194	0.0	0.0
K25	78	195	0.0	0.0
K25	78	196	0.0	0.0
K25	78	197	0.0	0.0
K25	78	198	0.0	0.0
K25	78	199	0.0	0.0
K25	78	200	0.0	0.0
K25	78	201	19.8	0.8
K25	78	202	6.3	0.2
K25	78	203	5.8	0.2
K25	78	204	0.0	0.0
K25	78	205	0.0	0.0
K25	78	206	0.0	0.0
K25	78	207	0.0	0.0
K25	78	208	0.0	0.0
K25	78	209	0.0	0.0
K25	78	210	0.0	0.0
K25	78	211	1.5	0.1
K25	78	213	0.0	0.0
K25	78	214	2.5	0.1
K25	78	215	1.3	0.0
K25	78	216	0.3	0.0
K25	78	217	0.0	0.0
K25	78	218	0.0	0.0
K25	78	219	0.0	0.0
K25	78	220	0.0	0.0
K25	78	221	0.0	0.0
K25	78	222	0.0	0.0
K25	78	223	0.0	0.0
K25	78	224	0.0	0.0
K25	78	225	0.0	0.0
K25	78	226	0.0	0.0
K25	78	235	0.0	0.0
K25	78	236	0.0	0.0
K25	78	237	0.0	0.0
K25	78	238	1.3	0.0
K25	78	239	0.0	0.0
K25	78	240	0.3	0.0
K25	78	241	0.0	0.0
K26	78	121	19.8	0.8
K26	78	122	5.3	0.2
K26	78	123	0.0	0.0
K26	78	124	0.0	0.0
K26	78	125	0.0	0.0
K26	78	126	29.5	1.2
K26	78	127	0.8	0.0
K26	78	128	0.0	0.0
K26	78	129	0.0	0.0
K26	78	130	0.0	0.0
K26	78	131	0.0	0.0
K26	78	132	0.3	0.0
K26	78	133	0.0	0.0
K26	78	134	0.0	0.0
K26	78	135	0.0	0.0
K26	78	136	0.0	0.0
K26	78	137	0.0	0.0
K26	78	138	11.4	0.4
K26	78	146	0.0	0.0
K26	78	169	1.5	0.1
K26	78	170	0.0	0.0
K26	78	171	6.4	0.3
K26	78	172	0.0	0.0
K26	78	173	0.0	0.0
K26	78	174	0.0	0.0
K26	78	175	0.0	0.0
K26	78	176	0.0	0.0
K26	78	177	0.0	0.0
K26	78	178	13.7	0.5
K26	78	179	3.0	0.1
K26	78	180	0.0	0.0
K26	78	182	2.0	0.1
K26	78	183	0.0	0.0
K26	78	184	0.5	0.0
K26	78	185	0.0	0.0
K26	78	186	0.0	0.0
K26	78	187	0.0	0.0
K26	78	188	0.0	0.0
K26	78	189	0.0	0.0
K26	78	190	0.0	0.0
K26	78	191	0.0	0.0
K26	78	192	0.0	0.0
K26	78	193	0.0	0.0
K26	78	194	0.0	0.0
K26	78	195	1.3	0.0
K26	78	196	0.0	0.0
K26	78	197	8.1	0.3
K26	78	198	0.0	0.0
K26	78	199	0.0	0.0
K26	78	200	0.0	0.0
K26	78	201	14.5	0.6
K26	78	202	11.4	0.4
K26	78	203	25.1	1.0
K26	78	204	0.0	0.0
K26	78	205	0.0	0.0
K26	78	206	0.0	0.0
K26	78	207	0.0	0.0
K26	78	208	0.0	0.0
K26	78	209	0.0	0.0
K26	78	210	0.0	0.0
K26	78	211	1.0	0.0
K26	78	213	0.0	0.0
K26	78	214	5.8	0.2
K26	78	215	0.8	0.0
K26	78	216	1.0	0.0
K26	78	217	0.0	0.0
K26	78	218	0.0	0.0
K26	78	219	0.0	0.0
K26	78	220	0.0	0.0
K26	78	221	0.0	0.0
K26	78	222	0.0	0.0
K26	78	223	0.0	0.0
K26	78	224	0.0	0.0
K26	78	225	0.0	0.0
K26	78	226	0.0	0.0
K26	78	227	15.7	0.6
K26	78	228	0.0	0.0
K26	78	229	0.0	0.0
K26	78	230	0.0	0.0
K26	78	231	0.0	0.0
K26	78	232	0.0	0.0
K26	78	233	0.0	0.0
K26	78	234	0.0	0.0
K26	78	235	0.0	0.0
K26	78	236	0.0	0.0
K26	78	237	0.3	0.0
K26	78	238	3.3	0.1
K26	78	239	0.0	0.0
K26	78	240	0.0	0.0
K26	78	241	0.0	0.0
K27	78	121	20.1	0.8
K27	78	122	5.8	0.2
K27	78	123	0.0	0.0
K27	78	124	0.0	0.0
K27	78	125	0.0	0.0
K27	78	126	29.7	1.2
K27	78	127	0.5	0.0
K27	78	128	0.0	0.0
K27	78	129	0.0	0.0
K27	78	130	0.0	0.0
K27	78	131	0.0	0.0
K27	78	132	0.0	0.0
K27	78	133	0.0	0.0
K27	78	134	0.0	0.0
K27	78	135	0.0	0.0
K27	78	136	0.0	0.0
K27	78	137	0.0	0.0

TABLE 18.— Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K27	78	138	23.1	0.9
K27	78	140	0.0	0.0
K27	78	141	0.0	0.0
K27	78	142	0.0	0.0
K27	78	143	0.0	0.0
K27	78	144	0.0	0.0
K27	78	145	0.0	0.0
K27	78	146	0.0	0.0
K27	78	147	2.5	0.1
K27	78	148	0.0	0.0
K27	78	149	0.0	0.0
K27	78	150	0.0	0.0
K27	78	152	0.0	0.0
K27	78	153	2.8	0.1
K27	78	154	0.3	0.0
K27	78	155	62.7	2.5
K27	78	156	0.0	0.0
K27	78	157	9.9	0.4
K27	78	158	0.0	0.0
K27	78	159	0.0	0.0
K27	78	160	0.0	0.0
K27	78	161	0.0	0.0
K27	78	162	0.0	0.0
K27	78	163	0.0	0.0
K27	78	164	0.0	0.0
K27	78	165	0.0	0.0
K27	78	166	0.0	0.0
K27	78	167	0.0	0.0
K27	78	168	0.0	0.0
K27	78	169	1.5	0.1
K27	78	170	0.0	0.0
K27	78	171	3.0	0.1
K27	78	172	0.0	0.0
K27	78	173	0.0	0.0
K27	78	174	0.0	0.0
K27	78	175	0.0	0.0
K27	78	176	0.0	0.0
K27	78	177	0.0	0.0
K27	78	178	22.4	0.9
K27	78	179	3.6	0.1
K27	78	180	0.0	0.0
K27	78	182	0.8	0.0
K27	78	183	0.0	0.0
K27	78	184	0.8	0.0
K27	78	185	0.0	0.0
K27	78	186	0.0	0.0
K27	78	187	0.3	0.0
K27	78	188	0.0	0.0
K27	78	189	0.0	0.0
K27	78	190	1.3	0.0
K27	78	191	0.0	0.0
K27	78	192	0.0	0.0
K27	78	193	0.0	0.0
K27	78	194	0.0	0.0
K27	78	195	2.0	0.1
K27	78	196	0.0	0.0
K27	78	197	1.8	0.1
K27	78	198	0.0	0.0
K27	78	199	0.0	0.0
K27	78	200	0.0	0.0
K27	78	201	7.9	0.3
K27	78	202	10.2	0.4
K27	78	203	47.5	1.9
K27	78	204	0.0	0.0
K27	78	205	0.0	0.0
K27	78	206	0.0	0.0
K27	78	207	0.0	0.0
K27	78	208	0.0	0.0
K27	78	209	0.0	0.0
K27	78	210	0.0	0.0
K27	78	211	1.0	0.0
K27	78	213	0.0	0.0
K27	78	214	3.0	0.1
K27	78	215	1.8	0.1
K27	78	216	1.0	0.0
K27	78	217	0.0	0.0
K27	78	218	0.0	0.0
K27	78	219	0.0	0.0
K27	78	220	0.0	0.0

Rain gage number	Year	Day	Rainfall	
			mm	in.
K27	78	221	0.0	0.0
K27	78	222	0.0	0.0
K27	78	223	0.0	0.0
K27	78	224	0.0	0.0
K27	78	225	0.0	0.0
K27	78	226	0.0	0.0
K27	78	227	15.5	0.6
K27	78	228	0.0	0.0
K27	78	229	0.0	0.0
K27	78	230	0.0	0.0
K27	78	231	0.0	0.0
K27	78	232	0.0	0.0
K27	78	233	0.0	0.0
K27	78	234	0.0	0.0
K27	78	235	0.0	0.0
K27	78	236	0.0	0.0
K27	78	237	0.0	0.0
K27	78	238	13.2	0.5
K27	78	239	0.0	0.0
K27	78	240	0.0	0.0
K27	78	241	0.0	0.0
K28	78	121	18.0	0.7
K28	78	122	4.6	0.2
K28	78	123	0.0	0.0
K28	78	124	0.0	0.0
K28	78	125	0.0	0.0
K28	78	126	30.7	1.2
K28	78	127	1.0	0.0
K28	78	128	0.0	0.0
K28	78	129	0.0	0.0
K28	78	130	0.0	0.0
K28	78	131	0.0	0.0
K28	78	132	0.0	0.0
K28	78	133	0.0	0.0
K28	78	134	0.0	0.0
K28	78	135	0.0	0.0
K28	78	136	0.0	0.0
K28	78	137	0.0	0.0
K28	78	138	19.0	0.7
K28	78	140	0.0	0.0
K28	78	141	0.0	0.0
K28	78	142	0.0	0.0
K28	78	143	0.0	0.0
K28	78	144	0.0	0.0
K28	78	145	0.0	0.0
K28	78	146	0.0	0.0
K28	78	147	3.6	0.1
K28	78	148	0.0	0.0
K28	78	149	0.0	0.0
K28	78	150	0.0	0.0
K28	78	152	0.0	0.0
K28	78	153	1.5	0.1
K28	78	154	0.0	0.0
K28	78	155	52.1	2.0
K28	78	156	0.0	0.0
K28	78	157	9.1	0.4
K28	78	158	0.0	0.0
K28	78	159	0.0	0.0
K28	78	160	0.0	0.0
K28	78	161	0.0	0.0
K28	78	162	0.0	0.0
K28	78	163	0.0	0.0
K28	78	164	0.0	0.0
K28	78	165	0.0	0.0
K28	78	166	0.0	0.0
K28	78	167	0.0	0.0
K28	78	168	0.0	0.0
K28	78	169	1.8	0.1
K28	78	170	0.0	0.0
K28	78	171	1.3	0.0
K28	78	172	0.0	0.0
K28	78	173	0.0	0.0
K28	78	174	0.0	0.0
K28	78	175	0.3	0.0
K28	78	176	0.0	0.0
K28	78	177	0.0	0.0
K28	78	178	14.2	0.6
K28	78	179	4.6	0.2
K28	78	180	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K28	78	182	0.8	0.0
K28	78	183	0.0	0.0
K28	78	184	0.5	0.0
K28	78	185	0.0	0.0
K28	78	190	0.8	0.0
K28	78	191	0.0	0.0
K28	78	192	0.0	0.0
K28	78	193	0.0	0.0
K28	78	194	0.0	0.0
K28	78	195	0.5	0.0
K28	78	196	0.0	0.0
K28	78	197	0.8	0.0
K28	78	198	0.0	0.0
K28	78	199	0.0	0.0
K28	78	200	0.0	0.0
K28	78	201	8.4	0.3
K28	78	202	12.7	0.5
K28	78	203	32.0	1.3
K28	78	204	0.0	0.0
K28	78	205	0.0	0.0
K28	78	206	0.0	0.0
K28	78	207	0.0	0.0
K28	78	208	0.0	0.0
K28	78	209	0.0	0.0
K28	78	210	0.0	0.0
K28	78	211	0.0	0.0
K28	78	213	0.0	0.0
K28	78	214	2.8	0.1
K28	78	215	1.8	0.1
K28	78	222	0.0	0.0
K28	78	223	0.0	0.0
K28	78	224	0.0	0.0
K28	78	225	0.0	0.0
K28	78	226	0.0	0.0
K28	78	236	0.0	0.0
K28	78	237	0.8	0.0
K28	78	238	13.5	0.5
K28	78	239	0.0	0.0
K28	78	240	0.0	0.0
K28	78	241	0.0	0.0
K29	78	121	17.8	0.7
K29	78	122	4.8	0.2
K29	78	123	0.0	0.0
K29	78	124	0.0	0.0
K29	78	125	0.0	0.0
K29	78	126	35.3	1.4
K29	78	127	4.1	0.2
K29	78	128	0.0	0.0
K29	78	129	0.0	0.0
K29	78	130	0.0	0.0
K29	78	131	0.0	0.0
K29	78	132	0.0	0.0
K29	78	133	0.0	0.0
K29	78	134	0.0	0.0
K29	78	135	0.0	0.0
K29	78	136	0.0	0.0
K29	78	137	0.0	0.0
K29	78	147	0.0	0.0
K29	78	148	0.0	0.0
K29	78	149	0.0	0.0
K29	78	150	0.0	0.0
K29	78	152	0.0	0.0
K29	78	153	1.8	0.1
K29	78	154	0.3	0.0
K29	78	155	42.9	1.7
K29	78	156	0.0	0.0
K29	78	157	23.4	0.9
K29	78	158	0.0	0.0
K29	78	159	0.0	0.0
K29	78	160	0.0	0.0
K29	78	161	0.0	0.0
K29	78	162	0.0	0.0
K29	78	163	0.0	0.0
K29	78	164	0.0	0.0
K29	78	165	0.0	0.0
K29	78	166	0.0	0.0
K29	78	167	0.0	0.0
K29	78	168	0.0	0.0
K29	78	169	1.8	0.1
K29	78	170	0.0	0.0
K29	78	171	5.8	0.2
K29	78	172	0.0	0.0
K29	78	173	0.0	0.0
K29	78	174	0.0	0.0
K29	78	175	0.0	0.0
K29	78	176	0.0	0.0
K29	78	177	0.0	0.0
K29	78	178	14.5	0.6
K29	78	179	3.8	0.1
K29	78	180	0.0	0.0
K29	78	182	1.3	0.0
K29	78	183	0.0	0.0
K29	78	184	0.3	0.0
K29	78	185	0.0	0.0
K29	78	186	0.0	0.0
K29	78	187	0.0	0.0
K29	78	188	0.0	0.0
K29	78	189	0.0	0.0
K29	78	190	0.8	0.0
K29	78	191	0.0	0.0
K29	78	192	0.0	0.0
K29	78	193	0.0	0.0
K29	78	194	0.0	0.0
K29	78	195	0.8	0.0
K29	78	196	0.0	0.0
K29	78	197	0.8	0.0
K29	78	198	0.0	0.0
K29	78	199	0.0	0.0
K29	78	200	0.0	0.0
K29	78	201	10.4	0.4
K29	78	202	12.4	0.5
K29	78	203	37.6	1.5
K29	78	204	0.0	0.0
K29	78	205	0.0	0.0
K29	78	206	0.0	0.0
K29	78	207	0.0	0.0
K29	78	208	0.0	0.0
K29	78	209	0.0	0.0
K29	78	210	0.0	0.0
K29	78	211	1.5	0.1
K29	78	213	0.0	0.0
K29	78	214	0.5	0.0
K29	78	215	1.5	0.1
K29	78	216	1.5	0.1
K29	78	217	0.0	0.0
K29	78	218	0.0	0.0
K29	78	219	0.0	0.0
K29	78	220	0.0	0.0
K29	78	221	0.0	0.0
K29	78	222	0.0	0.0
K29	78	223	0.0	0.0
K29	78	224	0.0	0.0
K29	78	225	0.0	0.0
K29	78	226	0.0	0.0
K29	78	227	13.0	0.5
K29	78	228	0.0	0.0
K29	78	229	0.0	0.0
K29	78	230	0.0	0.0
K29	78	231	0.0	0.0
K29	78	232	0.0	0.0
K29	78	233	0.0	0.0
K29	78	234	0.0	0.0
K29	78	235	0.0	0.0
K29	78	236	0.0	0.0
K29	78	237	0.3	0.0
K29	78	238	4.3	0.2
K29	78	239	0.0	0.0
K29	78	240	0.0	0.0
K29	78	241	0.0	0.0
K30	78	121	17.0	0.7
K30	78	122	4.3	0.2
K30	78	123	0.0	0.0
K30	78	125	0.0	0.0
K30	78	126	31.0	1.2
K30	78	127	1.3	0.0
K30	78	128	0.0	0.0
K30	78	129	0.0	0.0
K30	78	130	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall mm	Rainfall in.
K30	78	138	9.7	0.4
K30	78	139	0.0	0.0
K30	78	140	0.0	0.0
K30	78	141	0.0	0.0
K30	78	142	0.0	0.0
K30	78	143	0.0	0.0
K30	78	144	0.3	0.0
K30	78	153	2.0	0.1
K30	78	154	0.0	0.0
K30	78	155	46.7	1.8
K30	78	156	0.0	0.0
K30	78	157	31.7	1.2
K30	78	158	0.0	0.0
K30	78	159	0.0	0.0
K30	78	160	0.0	0.0
K30	78	161	0.0	0.0
K30	78	162	0.0	0.0
K30	78	163	0.0	0.0
K30	78	164	0.0	0.0
K30	78	165	0.0	0.0
K30	78	166	0.0	0.0
K30	78	167	0.0	0.0
K30	78	168	0.0	0.0
K30	78	169	1.5	0.1
K30	78	170	0.0	0.0
K30	78	171	3.3	0.1
K30	78	172	0.0	0.0
K30	78	173	0.0	0.0
K30	78	174	0.0	0.0
K30	78	175	0.0	0.0
K30	78	176	0.0	0.0
K30	78	177	0.0	0.0
K30	78	178	32.8	1.3
K30	78	179	2.8	0.1
K30	78	180	0.0	0.0
K30	78	182	0.0	0.0
K30	78	183	0.0	0.0
K30	78	184	0.0	0.0
K30	78	185	0.0	0.0
K30	78	186	0.0	0.0
K30	78	187	0.0	0.0
K30	78	188	0.0	0.0
K30	78	189	0.0	0.0
K30	78	190	0.3	0.0
K30	78	191	0.0	0.0
K30	78	192	0.0	0.0
K30	78	193	0.0	0.0
K30	78	194	0.0	0.0
K30	78	195	0.3	0.0
K30	78	196	0.0	0.0
K30	78	197	0.0	0.0
K30	78	198	0.0	0.0
K30	78	199	0.0	0.0
K30	78	200	0.0	0.0
K30	78	201	20.6	0.8
K30	78	202	7.1	0.3
K30	78	203	52.1	2.0
K30	78	204	0.0	0.0
K30	78	205	0.0	0.0
K30	78	206	0.0	0.0
K30	78	207	0.0	0.0
K30	78	208	0.0	0.0
K30	78	209	0.0	0.0
K30	78	210	0.0	0.0
K30	78	211	0.5	0.0
K30	78	213	0.0	0.0
K30	78	214	0.3	0.0
K30	78	215	2.3	0.1
K30	78	216	2.8	0.1
K30	78	217	0.0	0.0
K30	78	218	0.0	0.0
K30	78	219	0.0	0.0
K30	78	220	0.0	0.0
K30	78	221	0.0	0.0
K30	78	222	0.0	0.0
K30	78	223	0.0	0.0
K30	78	224	0.0	0.0
K30	78	225	0.0	0.0
K30	78	226	0.0	0.0
K30	78	227	8.9	0.3
K30	78	228	0.0	0.0
K30	78	229	0.0	0.0
K30	78	230	0.0	0.0
K30	78	231	0.0	0.0
K30	78	232	0.0	0.0
K30	78	233	0.0	0.0
K30	78	234	0.0	0.0
K30	78	235	0.0	0.0
K30	78	236	0.0	0.0
K30	78	237	0.0	0.0
K30	78	238	1.8	0.1
K30	78	239	0.0	0.0
K30	78	240	0.0	0.0
K30	78	241	0.0	0.0
K31	78	121	17.5	0.7
K31	78	122	3.8	0.1
K31	78	123	0.0	0.0
K31	78	124	0.0	0.0
K31	78	125	0.0	0.0
K31	78	126	32.0	1.3
K31	78	127	1.5	0.1
K31	78	128	0.0	0.0
K31	78	129	0.0	0.0
K31	78	130	0.0	0.0
K31	78	131	0.0	0.0
K31	78	132	0.0	0.0
K31	78	133	0.0	0.0
K31	78	134	0.0	0.0
K31	78	135	0.0	0.0
K31	78	136	0.0	0.0
K31	78	137	0.0	0.0
K31	78	138	37.6	1.5
K31	78	139	0.0	0.0
K31	78	140	0.0	0.0
K31	78	141	0.0	0.0
K31	78	142	0.0	0.0
K31	78	143	0.0	0.0
K31	78	144	0.0	0.0
K31	78	155	66.8	2.6
K31	78	156	0.0	0.0
K31	78	157	28.4	1.1
K31	78	158	0.0	0.0
K31	78	159	0.0	0.0
K31	78	160	0.0	0.0
K31	78	161	0.0	0.0
K31	78	162	0.0	0.0
K31	78	163	0.0	0.0
K31	78	164	0.0	0.0
K31	78	165	0.0	0.0
K31	78	166	0.0	0.0
K31	78	167	0.0	0.0
K31	78	168	0.0	0.0
K31	78	169	2.0	0.1
K31	78	170	0.0	0.0
K31	78	171	1.3	0.0
K31	78	172	0.5	0.0
K31	78	173	0.0	0.0
K31	78	174	0.0	0.0
K31	78	175	0.0	0.0
K31	78	176	0.0	0.0
K31	78	177	0.0	0.0
K31	78	178	21.1	0.8
K31	78	179	0.3	0.0
K31	78	180	0.0	0.0
K31	78	182	0.0	0.0
K31	78	183	0.0	0.0
K31	78	184	0.0	0.0
K31	78	185	0.0	0.0
K31	78	186	0.0	0.0
K31	78	187	0.0	0.0
K31	78	188	0.0	0.0
K31	78	189	0.0	0.0
K31	78	190	0.3	0.0
K31	78	191	0.0	0.0
K31	78	192	0.0	0.0
K31	78	193	0.0	0.0
K31	78	194	0.0	0.0
K31	78	195	0.8	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K31	78	196	0.0	0.0
K31	78	197	0.0	0.0
K31	78	198	0.0	0.0
K31	78	199	0.0	0.0
K31	78	200	0.0	0.0
K31	78	201	23.9	0.9
K31	78	202	9.4	0.4
K31	78	203	26.2	1.0
K31	78	204	0.0	0.0
K31	78	205	0.0	0.0
K31	78	206	0.0	0.0
K31	78	207	0.0	0.0
K31	78	208	0.0	0.0
K31	78	209	0.0	0.0
K31	78	210	0.0	0.0
K31	78	211	1.0	0.0
K31	78	213	0.0	0.0
K32	78	121	17.3	0.7
K32	78	122	4.6	0.2
K32	78	123	0.0	0.0
K32	78	124	0.0	0.0
K32	78	125	0.0	0.0
K32	78	126	34.8	1.4
K32	78	127	0.8	0.0
K32	78	128	0.0	0.0
K32	78	129	0.0	0.0
K32	78	130	0.0	0.0
K32	78	131	0.0	0.0
K32	78	132	0.0	0.0
K32	78	133	0.0	0.0
K32	78	134	0.0	0.0
K32	78	135	0.0	0.0
K32	78	136	0.0	0.0
K32	78	137	0.0	0.0
K32	78	138	14.0	0.5
K32	78	139	0.0	0.0
K32	78	140	0.0	0.0
K32	78	142	0.0	0.0
K32	78	143	0.0	0.0
K32	78	144	0.0	0.0
K32	78	153	1.5	0.1
K32	78	154	0.0	0.0
K32	78	155	62.5	2.5
K32	78	156	0.0	0.0
K32	78	157	33.8	1.3
K32	78	158	0.0	0.0
K32	78	159	0.0	0.0
K32	78	160	0.0	0.0
K32	78	161	0.0	0.0
K32	78	162	0.0	0.0
K32	78	163	0.0	0.0
K32	78	164	0.0	0.0
K32	78	165	0.0	0.0
K32	78	166	0.0	0.0
K32	78	167	0.0	0.0
K32	78	168	0.0	0.0
K32	78	169	2.0	0.1
K32	78	170	0.0	0.0
K32	78	172	0.8	0.0
K32	78	173	0.0	0.0
K32	78	174	0.0	0.0
K32	78	175	0.0	0.0
K32	78	176	0.0	0.0
K32	78	177	0.0	0.0
K32	78	178	35.8	1.4
K32	78	179	6.3	0.2
K32	78	180	0.0	0.0
K32	78	182	0.0	0.0
K32	78	183	0.0	0.0
K32	78	184	0.0	0.0
K32	78	185	0.0	0.0
K32	78	186	0.3	0.0
K32	78	187	0.5	0.0
K32	78	188	0.0	0.0
K32	78	189	0.0	0.0
K32	78	190	8.4	0.3
K32	78	191	0.0	0.0
K32	78	192	0.0	0.0
K32	78	193	0.0	0.0
K32	78	194	0.3	0.0
K32	78	195	0.0	0.0
K32	78	196	0.0	0.0
K32	78	197	0.0	0.0
K32	78	198	0.0	0.0
K32	78	199	0.0	0.0
K32	78	200	0.0	0.0
K32	78	201	20.8	0.8
K32	78	202	10.9	0.4
K32	78	203	43.4	1.7
K32	78	204	0.0	0.0
K32	78	205	0.0	0.0
K32	78	206	0.0	0.0
K32	78	207	0.0	0.0
K32	78	208	0.0	0.0
K32	78	209	0.0	0.0
K32	78	210	0.0	0.0
K32	78	211	0.3	0.0
K32	78	213	0.0	0.0
K33	78	121	17.3	0.7
K33	78	122	4.3	0.2
K33	78	123	0.0	0.0
K33	78	124	0.0	0.0
K33	78	125	0.0	0.0
K33	78	126	31.0	1.2
K33	78	127	0.5	0.0
K33	78	128	0.0	0.0
K33	78	129	0.0	0.0
K33	78	130	0.0	0.0
K33	78	131	0.0	0.0
K33	78	132	0.3	0.0
K33	78	133	0.0	0.0
K33	78	134	0.0	0.0
K33	78	135	0.0	0.0
K33	78	136	0.0	0.0
K33	78	137	0.0	0.0
K33	78	138	24.4	1.0
K33	78	140	0.0	0.0
K33	78	141	0.0	0.0
K33	78	142	0.0	0.0
K33	78	143	0.0	0.0
K33	78	144	1.0	0.0
K33	78	153	0.8	0.0
K33	78	154	0.0	0.0
K33	78	155	52.6	2.1
K33	78	156	0.0	0.0
K33	78	157	14.5	0.6
K33	78	158	0.0	0.0
K33	78	159	0.0	0.0
K33	78	160	0.0	0.0
K33	78	161	0.0	0.0
K33	78	162	0.0	0.0
K33	78	163	0.0	0.0
K33	78	164	0.0	0.0
K33	78	166	0.0	0.0
K33	78	167	0.0	0.0
K33	78	168	0.0	0.0
K33	78	169	2.3	0.1
K33	78	170	0.0	0.0
K33	78	171	0.3	0.0
K33	78	172	1.0	0.0
K33	78	173	0.0	0.0
K33	78	174	0.0	0.0
K33	78	175	0.0	0.0
K33	78	176	0.0	0.0
K33	78	177	0.0	0.0
K33	78	178	20.1	0.8
K33	78	179	7.1	0.3
K33	78	180	0.0	0.0
K33	78	182	0.3	0.0
K33	78	183	0.0	0.0
K33	78	184	0.0	0.0
K33	78	185	0.0	0.0
K33	78	186	1.8	0.1
K33	78	187	0.0	0.0
K33	78	188	0.0	0.0
K33	78	189	0.0	0.0
K33	78	190	1.0	0.0
K33	78	191	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K33	78	192	0.0	0.0
K33	78	193	0.0	0.0
K33	78	194	0.0	0.0
K33	78	195	0.0	0.0
K33	78	196	0.0	0.0
K33	78	197	0.0	0.0
K33	78	198	0.0	0.0
K33	78	199	0.0	0.0
K33	78	200	0.0	0.0
K33	78	201	9.4	0.4
K33	78	202	10.9	0.4
K33	78	203	17.3	0.7
K33	78	204	0.0	0.0
K33	78	205	0.0	0.0
K33	78	206	0.0	0.0
K33	78	207	0.0	0.0
K33	78	208	0.0	0.0
K33	78	209	0.0	0.0
K33	78	210	0.0	0.0
K33	78	211	0.0	0.0
K33	78	213	0.0	0.0
K33	78	214	2.3	0.1
K33	78	215	2.3	0.1
K33	78	216	1.0	0.0
K33	78	217	0.0	0.0
K33	78	218	0.0	0.0
K33	78	219	0.0	0.0
K33	78	220	0.0	0.0
K33	78	221	0.0	0.0
K33	78	222	0.0	0.0
K33	78	223	0.0	0.0
K33	78	224	0.0	0.0
K33	78	225	0.0	0.0
K33	78	226	0.0	0.0
K33	78	227	10.4	0.4
K33	78	228	0.0	0.0
K33	78	229	0.0	0.0
K33	78	230	0.0	0.0
K33	78	231	0.0	0.0
K33	78	232	0.0	0.0
K33	78	233	0.0	0.0
K33	78	234	0.0	0.0
K33	78	235	0.0	0.0
K33	78	236	0.0	0.0
K33	78	237	0.3	0.0
K33	78	238	2.3	0.1
K33	78	239	0.0	0.0
K33	78	240	0.0	0.0
K33	78	241	0.0	0.0
K34	78	121	16.3	0.6
K34	78	122	5.8	0.2
K34	78	123	0.0	0.0
K34	78	124	0.0	0.0
K34	78	125	0.0	0.0
K34	78	126	30.0	1.2
K34	78	127	1.3	0.0
K34	78	128	0.0	0.0
K34	78	129	0.0	0.0
K34	78	130	0.0	0.0
K34	78	131	0.0	0.0
K34	78	132	0.0	0.0
K34	78	133	0.0	0.0
K34	78	135	0.0	0.0
K34	78	136	0.0	0.0
K34	78	137	0.0	0.0
K34	78	138	12.4	0.5
K34	78	139	0.0	0.0
K34	78	140	0.0	0.0
K34	78	141	0.0	0.0
K34	78	142	0.0	0.0
K34	78	143	0.0	0.0
K34	78	144	0.0	0.0
K34	78	145	0.0	0.0
K34	78	146	0.0	0.0
K34	78	147	0.0	0.0
K34	78	153	2.0	0.1
K34	78	154	0.0	0.0
K34	78	155	30.7	1.2
K34	78	156	0.0	0.0

Rain gage number	Year	Day	Rainfall	
			mm	in.
K34	78	157	13.0	0.5
K34	78	158	0.0	0.0
K34	78	159	0.0	0.0
K34	78	160	0.0	0.0
K34	78	161	0.0	0.0
K34	78	162	0.0	0.0
K34	78	163	0.0	0.0
K34	78	164	0.0	0.0
K34	78	165	0.0	0.0
K34	78	166	0.0	0.0
K34	78	167	0.0	0.0
K34	78	168	0.0	0.0
K34	78	169	1.0	0.0
K34	78	170	0.0	0.0
K34	78	171	3.0	0.1
K34	78	172	0.0	0.0
K34	78	173	0.0	0.0
K34	78	174	0.0	0.0
K34	78	175	0.0	0.0
K34	78	176	0.0	0.0
K34	78	177	0.0	0.0
K34	78	178	8.1	0.3
K34	78	179	3.8	0.1
K34	78	180	0.0	0.0
K34	78	182	0.5	0.0
K34	78	183	0.0	0.0
K34	78	184	0.5	0.0
K34	78	185	0.0	0.0
K34	78	186	0.0	0.0
K34	78	187	0.3	0.0
K34	78	188	0.0	0.0
K34	78	189	0.0	0.0
K34	78	190	1.3	0.0
K34	78	191	0.0	0.0
K34	78	192	0.0	0.0
K34	78	193	0.0	0.0
K34	78	194	0.0	0.0
K34	78	195	0.0	0.0
K34	78	196	0.0	0.0
K34	78	197	0.0	0.0
K34	78	198	0.0	0.0
K34	78	199	0.0	0.0
K34	78	200	0.0	0.0
K34	78	201	8.9	0.3
K34	78	202	12.7	0.5
K34	78	203	24.9	1.0
K34	78	204	0.0	0.0
K34	78	205	0.0	0.0
K34	78	206	0.0	0.0
K34	78	207	0.0	0.0
K34	78	208	0.0	0.0
K34	78	209	0.0	0.0
K34	78	210	0.0	0.0
K34	78	211	0.0	0.0
K34	78	213	2.0	0.0
K34	78	214	5.1	0.2
K34	78	215	0.8	0.0
K34	78	216	1.3	0.0
K34	78	217	0.0	0.0
K34	78	218	0.0	0.0
K34	78	219	0.0	0.0
K34	78	220	0.0	0.0
K34	78	221	0.5	0.0
K34	78	222	0.0	0.0
K34	78	223	0.0	0.0
K34	78	224	0.0	0.0
K34	78	225	0.0	0.0
K34	78	226	0.5	0.0
K34	78	227	16.8	0.7
K34	78	228	0.0	0.0
K34	78	229	0.0	0.0
K34	78	230	0.0	0.0
K34	78	231	0.0	0.0
K34	78	232	0.0	0.0
K34	78	233	0.0	0.0
K34	78	234	0.0	0.0
K34	78	235	0.0	0.0
K34	78	236	0.0	0.0
K34	78	237	1.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K34	78	238	1.3	0.0
K34	78	239	0.0	0.0
K34	78	240	0.3	0.0
K34	78	241	0.0	0.0
K34	78	242	0.0	0.0
K35	78	213	0.0	0.0
K35	78	121	16.8	0.7
K35	78	122	3.3	0.1
K35	78	123	0.0	0.0
K35	78	124	0.0	0.0
K35	78	125	0.0	0.0
K35	78	126	29.0	1.1
K35	78	127	0.5	0.0
K35	78	128	0.0	0.0
K35	78	129	0.0	0.0
K35	78	130	0.0	0.0
K35	78	131	0.0	0.0
K35	78	132	0.0	0.0
K35	78	133	0.0	0.0
K35	78	134	0.0	0.0
K35	78	135	0.0	0.0
K35	78	136	0.0	0.0
K35	78	137	0.0	0.0
K35	78	138	20.1	0.8
K35	78	139	0.0	0.0
K35	78	140	0.0	0.0
K35	78	141	0.0	0.0
K35	78	142	0.0	0.0
K35	78	143	0.0	0.0
K35	78	144	0.0	0.0
K35	78	145	0.0	0.0
K35	78	146	0.0	0.0
K35	78	147	0.3	0.0
K35	78	148	1.0	0.0
K35	78	149	0.0	0.0
K35	78	150	0.0	0.0
K35	78	152	0.0	0.0
K35	78	153	1.3	0.0
K35	78	154	0.0	0.0
K35	78	155	67.1	2.6
K35	78	156	0.0	0.0
K35	78	157	15.5	0.6
K35	78	158	0.0	0.0
K35	78	159	0.0	0.0
K35	78	160	0.0	0.0
K35	78	161	0.0	0.0
K35	78	162	0.0	0.0
K35	78	163	0.0	0.0
K35	78	164	0.0	0.0
K35	78	165	0.0	0.0
K35	78	166	0.0	0.0
K35	78	167	0.0	0.0
K35	78	168	0.0	0.0
K35	78	169	1.0	0.0
K35	78	170	0.0	0.0
K35	78	171	0.5	0.0
K35	78	172	0.3	0.0
K35	78	173	0.0	0.0
K35	78	174	0.0	0.0
K35	78	175	0.0	0.0
K35	78	176	0.0	0.0
K35	78	177	0.0	0.0
K35	78	178	16.8	0.7
K35	78	179	5.8	0.2
K35	78	180	0.0	0.0
K35	78	182	0.0	0.0
K35	78	183	0.0	0.0
K35	78	184	0.0	0.0
K35	78	185	0.0	0.0
K35	78	186	3.0	0.1
K35	78	187	2.3	0.1
K35	78	188	0.0	0.0
K35	78	189	0.0	0.0
K35	78	194	0.0	0.0
K35	78	195	0.8	0.0
K35	78	196	0.0	0.0
K35	78	197	0.0	0.0
K35	78	198	0.0	0.0
K35	78	199	0.0	0.0
K35	78	200	0.0	0.0
K35	78	201	11.9	0.5
K35	78	202	5.1	0.2
K35	78	207	0.0	0.0
K35	78	208	0.0	0.0
K35	78	209	0.0	0.0
K35	78	210	0.0	0.0
K35	78	211	0.0	0.0
K36	78	121	15.0	0.6
K36	78	122	3.0	0.1
K36	78	123	0.0	0.0
K36	78	124	0.0	0.0
K36	78	125	0.0	0.0
K36	78	126	27.9	1.1
K36	78	127	0.3	0.0
K36	78	128	0.0	0.0
K36	78	129	0.0	0.0
K36	78	130	0.0	0.0
K36	78	131	0.0	0.0
K36	78	132	0.0	0.0
K36	78	133	0.0	0.0
K36	78	134	0.0	0.0
K36	78	135	0.0	0.0
K36	78	136	0.0	0.0
K36	78	137	0.0	0.0
K36	78	138	15.0	0.6
K36	78	140	0.0	0.0
K36	78	141	0.0	0.0
K36	78	142	0.0	0.0
K36	78	143	0.0	0.0
K36	78	144	0.3	0.0
K36	78	145	0.0	0.0
K36	78	146	0.0	0.0
K36	78	147	1.3	0.0
K36	78	148	1.5	0.1
K36	78	149	0.0	0.0
K36	78	150	0.0	0.0
K36	78	152	0.0	0.0
K36	78	153	1.5	0.1
K36	78	154	0.0	0.0
K36	78	155	69.6	2.7
K36	78	156	0.0	0.0
K36	78	157	12.2	0.5
K36	78	158	0.0	0.0
K36	78	159	0.0	0.0
K36	78	160	0.0	0.0
K36	78	161	0.0	0.0
K36	78	162	0.0	0.0
K36	78	163	0.0	0.0
K36	78	164	0.0	0.0
K36	78	165	0.0	0.0
K36	78	166	0.0	0.0
K36	78	167	0.0	0.0
K36	78	168	0.0	0.0
K36	78	169	0.5	0.0
K36	78	170	0.0	0.0
K36	78	171	1.3	0.0
K36	78	172	0.0	0.0
K36	78	173	0.0	0.0
K36	78	174	0.0	0.0
K36	78	175	0.0	0.0
K36	78	176	0.0	0.0
K36	78	177	0.0	0.0
K36	78	178	8.4	0.3
K36	78	179	5.6	0.2
K36	78	180	0.0	0.0
K36	78	182	0.5	0.0
K36	78	183	0.0	0.0
K36	78	184	0.0	0.0
K36	78	185	0.0	0.0
K36	78	186	0.0	0.0
K36	78	187	0.5	0.0
K36	78	188	0.0	0.0
K36	78	189	0.0	0.0
K36	78	190	23.9	0.9
K36	78	191	0.0	0.0
K36	78	192	0.0	0.0
K36	78	193	0.0	0.0
K36	78	194	0.0	0.0

TABLE 18.– Continued.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K36	78	195	0.0	0.0
K36	78	196	0.0	0.0
K36	78	197	0.0	0.0
K36	78	198	0.0	0.0
K36	78	199	0.0	0.0
K36	78	200	0.0	0.0
K36	78	201	8.6	0.3
K36	78	202	11.9	0.5
K36	78	203	10.4	0.4
K36	78	204	0.0	0.0
K36	78	205	0.0	0.0
K36	78	206	0.0	0.0
K36	78	207	0.0	0.0
K36	78	208	0.0	0.0
K36	78	209	0.0	0.0
K36	78	210	0.0	0.0
K36	78	211	0.0	0.0
K36	78	213	0.0	0.0
K37	78	121	10.4	0.4
K37	78	122	1.5	0.1
K37	78	123	0.0	0.0
K37	78	124	0.0	0.0
K37	78	125	0.0	0.0
K37	78	126	18.0	0.7
K37	78	127	2.0	0.1
K37	78	128	0.0	0.0
K37	78	129	0.0	0.0
K37	78	130	0.0	0.0
K37	78	131	0.0	0.0
K37	78	132	0.0	0.0
K37	78	133	0.0	0.0
K37	78	134	0.0	0.0
K37	78	135	0.0	0.0
K37	78	136	0.0	0.0
K37	78	137	0.0	0.0
K37	78	138	7.6	0.3
K37	78	139	0.0	0.0
K37	78	140	0.0	0.0
K37	78	142	0.0	0.0
K37	78	143	0.0	0.0
K37	78	144	0.8	0.0
K37	78	145	0.0	0.0
K37	78	146	0.0	0.0
K37	78	147	0.0	0.0
K37	78	148	0.5	0.0
K37	78	149	0.0	0.0
K37	78	150	0.0	0.0
K37	78	152	0.0	0.0
K37	78	153	2.3	0.1
K37	78	154	0.0	0.0
K37	78	155	66.5	2.6
K37	78	156	0.0	0.0
K37	78	157	18.5	0.7
K37	78	158	0.0	0.0
K37	78	159	0.0	0.0
K37	78	160	0.0	0.0
K37	78	161	0.0	0.0
K37	78	162	0.0	0.0
K37	78	163	0.0	0.0
K37	78	164	0.0	0.0
K37	78	165	0.0	0.0
K37	78	166	0.0	0.0
K37	78	167	0.0	0.0
K37	78	168	0.0	0.0
K37	78	169	0.8	0.0
K37	78	170	0.0	0.0
K37	78	171	2.5	0.1
K37	78	172	0.0	0.0
K37	78	173	0.0	0.0
K37	78	174	0.0	0.0
K37	78	175	0.0	0.0
K37	78	176	0.0	0.0
K37	78	177	0.0	0.0
K37	78	178	11.2	0.4
K37	78	179	6.1	0.2
K37	78	180	0.0	0.0
K37	78	182	0.0	0.0
K37	78	183	0.0	0.0
K37	78	184	0.3	0.0
K37	78	185	0.0	0.0
K37	78	186	0.0	0.0
K37	78	187	0.0	0.0
K37	78	188	0.0	0.0
K37	78	189	0.0	0.0
K37	78	190	16.3	0.6
K37	78	191	0.0	0.0
K37	78	192	0.0	0.0
K37	78	193	0.0	0.0
K37	78	194	0.0	0.0
K37	78	195	0.3	0.0
K37	78	196	0.0	0.0
K37	78	197	0.0	0.0
K37	78	198	0.0	0.0
K37	78	199	0.0	0.0
K37	78	200	0.0	0.0
K37	78	201	6.1	0.2
K37	78	202	15.5	0.6
K37	78	203	8.6	0.3
K37	78	204	0.0	0.0
K37	78	205	0.0	0.0
K37	78	206	0.0	0.0
K37	78	207	0.0	0.0
K37	78	208	0.0	0.0
K37	78	209	0.0	0.0
K37	78	210	0.0	0.0
K37	78	211	0.0	0.0
K37	78	213	0.0	0.0
K38	78	124	0.0	0.0
K38	78	125	0.0	0.0
K38	78	126	33.5	1.3
K38	78	127	1.5	0.1
K38	78	133	0.0	0.0
K38	78	135	0.0	0.0
K38	78	136	0.0	0.0
K38	78	137	0.0	0.0
K38	78	138	15.2	0.6
K38	78	139	0.0	0.0
K38	78	140	0.0	0.0
K38	78	141	0.0	0.0
K38	78	142	0.0	0.0
K38	78	143	0.0	0.0
K38	78	144	2.0	0.1
K38	78	145	0.0	0.0
K38	78	146	0.0	0.0
K38	78	147	0.0	0.0
K38	78	153	1.3	0.0
K38	78	154	0.0	0.0
K38	78	155	26.7	1.0
K38	78	156	0.0	0.0
K38	78	157	23.5	0.9
K38	78	158	0.0	0.0
K38	78	159	0.0	0.0
K38	78	160	0.0	0.0
K38	78	161	0.0	0.0
K38	78	162	0.0	0.0
K38	78	163	0.0	0.0
K38	78	164	0.0	0.0
K38	78	165	0.0	0.0
K38	78	166	0.0	0.0
K38	78	167	0.0	0.0
K38	78	168	0.0	0.0
K38	78	169	0.3	0.0
K38	78	170	0.0	0.0
K38	78	171	1.3	0.0
K38	78	172	0.0	0.0
K38	78	173	0.0	0.0
K38	78	174	0.0	0.0
K38	78	175	0.0	0.0
K38	78	176	0.0	0.0
K38	78	177	0.0	0.0
K38	78	178	18.8	0.7
K38	78	179	9.7	0.4
K38	78	180	0.0	0.0
K38	78	182	2.8	0.1
K38	78	189	0.0	0.0
K38	78	190	7.4	0.3
K38	78	191	0.0	0.0
K38	78	207	0.0	0.0

TABLE 18.– Concluded.

Rain gage number	Year	Day	Rainfall	
			mm	in.
K38	78	208	0.0	0.0
K38	78	209	0.0	0.0
K38	78	210	0.0	0.0
K38	78	211	0.0	0.0
K39	78	124	0.0	0.0
K39	78	125	0.0	0.0
K39	78	[illegible]	29.5	1.2
K39	78	129	0.0	0.0
K39	78	130	0.0	0.0
K39	78	131	0.0	0.0
K39	78	132	0.0	0.0
K39	78	133	0.0	0.0
K39	78	134	0.0	0.0
K39	78	135	0.0	0.0
K39	78	137	0.0	0.0
K39	78	138	11.9	0.5
K39	78	141	0.0	0.0
K39	78	142	0.0	0.0
K39	78	143	0.0	0.0
K39	78	144	0.0	0.0
K39	78	145	0.0	0.0
K39	78	146	0.0	0.0
K39	78	147	0.0	0.0
K39	78	153	0.8	0.0
K39	78	154	0.0	0.0
K39	78	162	0.0	0.0
K39	78	163	0.0	0.0
K39	78	164	0.0	0.0
K39	78	165	0.0	0.0
K39	78	166	0.0	0.0
K39	78	167	0.0	0.0
K39	78	168	0.0	0.0
K39	78	169	0.0	0.0
K39	78	170	0.0	0.0
K39	78	171	0.0	0.0
K39	78	172	0.0	0.0
K39	78	173	0.0	0.0
K39	78	174	0.0	0.0
K39	78	175	0.0	0.0
K39	78	176	0.0	0.0
K39	78	177	0.0	0.0
K39	78	178	7.6	0.3
K39	78	179	1.3	0.0
K39	78	180	0.0	0.0
K39	78	182	0.0	0.0
K39	78	183	0.0	0.0
K39	78	184	0.0	0.0
K39	78	185	0.0	0.0
K39	78	186	0.0	0.0
K39	78	187	0.0	0.0
K39	78	188	0.0	0.0
K39	78	189	0.0	0.0
K39	78	190	0.0	0.0
K39	78	191	0.0	0.0
K39	78	192	0.0	0.0
K39	78	193	0.0	0.0
K39	78	194	0.0	0.0
K39	78	195	0.3	0.0
K39	78	196	0.0	0.0
K39	78	197	0.0	0.0
K39	78	198	0.0	0.0
K39	78	199	0.0	0.0
K39	78	200	0.0	0.0
K39	78	207	0.0	0.0
K39	78	208	0.0	0.0
K39	78	209	0.0	0.0
K39	78	210	0.0	0.0
K39	78	211	0.8	0.0
K39	78	213	0.3	0.0
K39	78	219	0.0	0.0
K39	78	220	0.0	0.0
K39	78	221	0.0	0.0
K39	78	222	0.0	0.0
K39	78	223	0.0	0.0
K39	78	224	0.0	0.0
K39	78	225	0.0	0.0
K39	78	226	1.3	0.0
K39	78	227	14.5	0.6
K39	78	228	0.0	0.0

Rain gage number	Year	Day	Rainfall	
			mm	in.
K39	78	229	0.0	0.0
K39	78	230	0.0	0.0
K39	78	231	0.0	0.0
K39	78	232	0.0	0.0
K39	78	233	0.0	0.0
K39	78	234	0.0	0.0
K39	78	235	0.0	0.0
K39	78	236	0.0	0.0
K39	78	237	0.0	0.0
K39	78	238	2.3	0.1
K39	78	239	0.0	0.0
K39	78	240	0.0	0.0
K39	78	241	0.0	0.0

TABLE 19.— NWS DATA

Day	Temperature, °F		Rainfall, 0.01 in.	Solar radiation, langleys	Wind run, statute miles	Pan Evaporation, 0.01 in.
	Max.	Min.				
121	54	43	93	89	143	00
122	54	38	36	310	141	08
123	50	35		374	38	10
124	52	31		324	68	14
125	54	34	02	70	55	11
126	46	35	120	58	124	00
127	41	35	25	426	98	00
128	58	35		490	111	23
129	61	33		560	179	28
130	68	40		540	111	30
131	83	49	0	445	161	34
132	79	48	01	530	113	27
133	65	36	0	571	224	46
134	74	47		543	68	28
135	85	48		561	66	32
136	78	46		541	180	40
137	69	48	0	69	125	30
138	61	44	122	554	142	22
139	74	49		372	90	25
140	75	44		544	80	24
141	76	47		352	69	26
142	72	54	T	501	120	17
143	79	53		531	64	25
144	86	59	T	380	120	53
145	89	60		457	198	40
146	80	56		532	202	41
147	96	58	T	421	182	40
148	79	49	36	420	47	34
149	63	48		539	202	30
150	78	52		567	105	30
151	82	52		327	135	42
152	65	49		315	92	18
153	61	49	03	156	83	15
154	50	50		248	54	10
155	68	53	167	483	78	29
156	73	54	T	134	59	16
157	67	47	146	465	63	43
158	73	51		527	55	15
159	73	47		579	87	29
160	78	52		569	69	29
161	89	61		584	246	56
162	93	57		609	239	57
163	82	50		544	116	44
164	79	54		569	80	35
165	89	64		571	215	47
166	96	65		583	188	50
167	102	61		546	130	54
168	94	57		564	110	45
169	80	57	01	511	130	46
170	85	58	T	499	145	42
171	94	59	T	494	150	44
172	78	55	T	335	90	35
173	78	59		524	156	20
174	93	65		529	118	38
175	92	68	T	452	114	43
176	100	64		461	93	49
177	98	62		478	98	45
178	89	60	18	372	138	45
179	86	62	32	500	116	40
180	89	64		504	120	50
181	93	61		455	184	45
182	90	61	04	527	142	41
183	94	59		487	81	43
184	97	61	03	532	126	54
185	102	69		495	213	81
186	102	70	04	510	253	79
187	101	69		528	181	64
188	90	60		555	125	47
189	88	64		493	107	48
190	107	68		272	172	60
191	79	57		444	146	37
192	80	61		495	109	31
193	98	65		535	170	57
194	103	64	T	468	100	50
195	87	62	01	572	113	43
196	99	70		508	113	47
197	97	61	T	517	105	54
198	101	68		533	151	69
199	104	71		470	99	54

[T = trace, less than 0.01 inches]

TABLE 19.– Concluded.

Day	Temperature, °F		Rainfall, 0.01 in.	Solar radiation, langleys	Wind run, statute miles	Pan Evaporation, 0.01 in.
	Max.	Min.				
200	89	68	T	480	109	41
201	90	65	91	427	118	34
202	89	66	20	322	90	30
203	88	58	25	488	80	22
204	75	53		526	94	30
205	81	53		567	124	37
206	94	54		564	165	45
207	101	65		568	106	53
208	91	57		558	75	45
209	95	67		567	161	60
210	102	71		500	175	71
211	86	62	05	487	108	41
212	90	58		424	62	35
213	90	60	02	455	127	35
214	87	59	12	454	84	36
215	82	54	15	140	129	38
216	62	51	07	262	65	11
217	69	53	T	532	73	15
218	83	55	T	544	104	34
219	90	59		394	99	42
220	90	58	T	511	91	35
221	91	57		502	83	41
222	89	58		506	66	39
223	91	57		532	64	34
224	90	57		524	56	39
225	101	60	T	535	88	51
226	102	68	07	322	166	67
227	93	52	57	542	127	55
228	93	51		543	113	42
229	97	54		552	99	43
230	100	60		504	28	52
231	78	51		527	215	41
232	81	55		465	114	42
233	92	55		501	189	46
234	95	64		499	72	38
235	97	67	T	526	224	66
236	98	61		431	56	42
237	99	60	02	311	112	50
238	90	61	16	491	34	20
239	91	53		241	61	32
240	84	52	02	420	71	23
241	81	57	T	278	67	25
242	77	57	02	441	84	21
243	78	55		476	111	32

[T = trace, less than 0.01 inches]

TABLE 20.– IRRIGATION DATA

[The irrigation information given below is for the entire quarter section (160 acres)]

Field 1

Start date: June 16, 1978

Stop date: Sept. 12, 1978

Irrigation rate: 550 gal/min

Approximate system revolution time: 9 days

System off time: Approximately 1 day from start date to stop date

Total water applied: ≈19.7 inches

Field 2

Start date: May 20, 1978

Stop date: Sept. 27, 1978

Irrigation rate: 550 gal/min

Approximate system revolution time: 9 to 10 days

System off time: about 7 days from start date to stop date

Total water applied: ≈27.8 inches

Field 3

Start date: June 17, 1978

Stop date: Sept. 8, 1978

Irrigation rate: 425 gal/min

Approximate system revolution time: 8 to 11 days

Total number of revolutions: 8

Boom position: June 17, south; June 23, ESE; June 30, south; July 7, east; July 14, NE; July 21, NW; July 28, SE; Aug. 4, SE; Aug. 11, ENE; Aug. 18, SW; Aug. 25, SE; Sept. 1, north; Sept. 8, south.

Total water applied: ≈16.3 inches

These systems operated continuously unless otherwise noted in the table. Each irrigation system is a rotary system located in the center of a quarter section (160 acres). The location of each of the three fields, in relation to the irrigation system, is shown in figure 5.

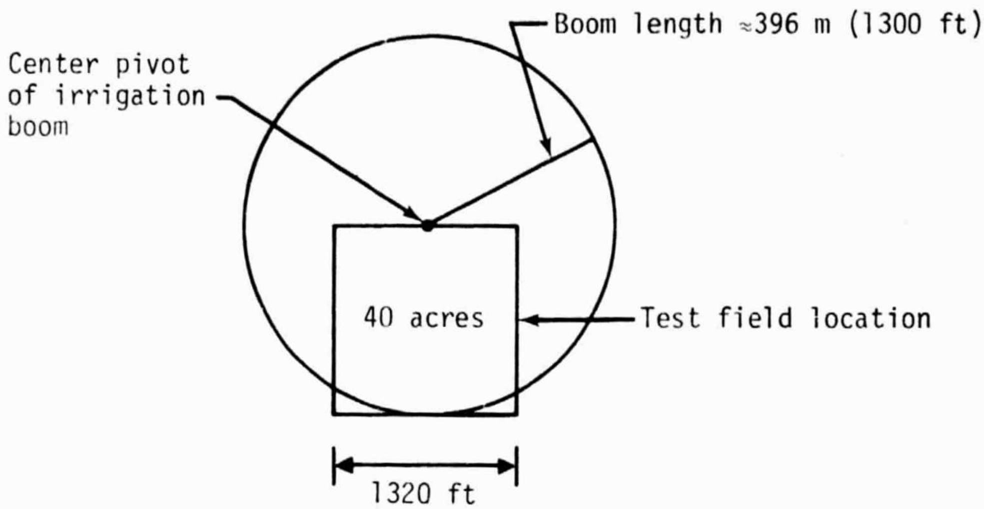


Figure 5.— Irrigation system location as related to test fields 1, 2, and 3.

4. TYPE II DATA

Data and samples were acquired from 43 fields in conjunction with seven aircraft overflights. Fields 1 through 14 were included in these 43 fields. Data consisted of soil moisture, bulk density, soil temperature measurements, vegetation samples, and photographs for estimating surface roughness.

Aircraft overflights occurred on July 18, 20, 21, and 22 and August 8, 9, and 11. Soil moisture and soil temperature measurements were made the same day as the aircraft overflights. Bulk density data, vegetation samples, and photographs for estimating surface roughness were acquired the same week as the aircraft overflights.

Date	Julian date	Aircraft flight	Data flight	Site
7/18	199	6	4	76
7/20	201	7	5	76
7/21	202	8	6/12	76/194
7/22	203	9	7	76
8/8	220	25	8	76
8/9	221	26	9/13	76/194
8/11	223	28	10	76

Soil moisture data and soil temperature data are available on magnetic tape.

4.1 SOIL MOISTURE

4.1.1 SAMPLE ACQUISITION

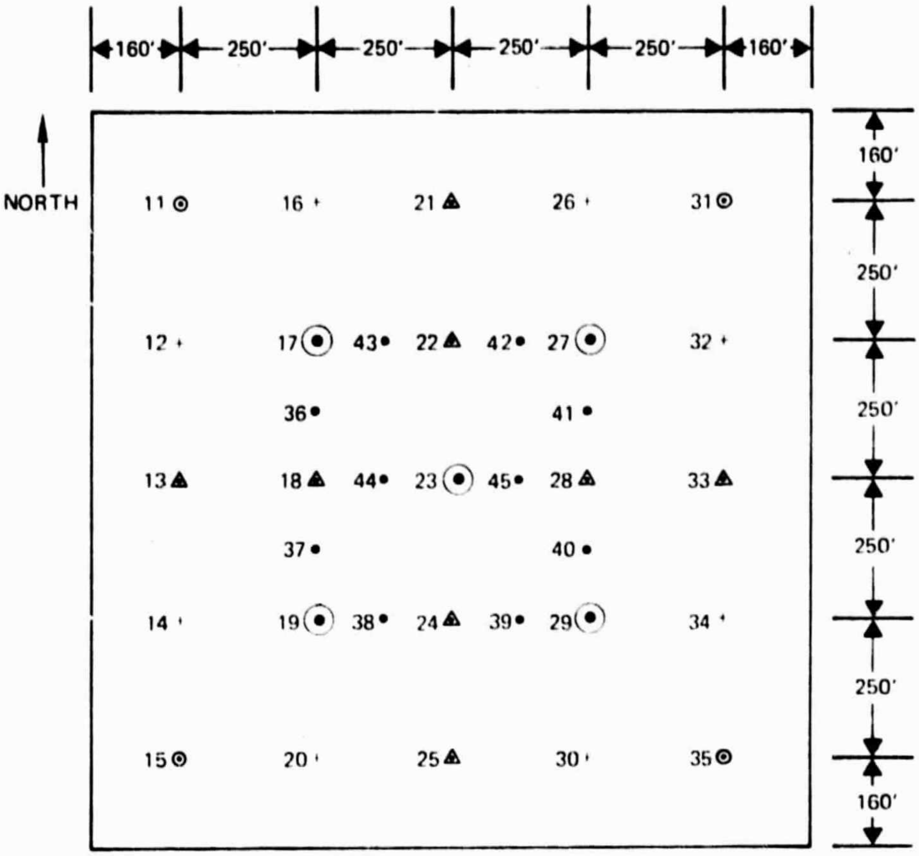
Gravimetric soil moisture data were acquired at each of the 35 locations and depths shown in figure 6. The samples for soil moisture were taken by local personnel hired in the Colby area. These personnel were given a training session along with the handout shown in appendix F, which defines the sampling procedure used. Table 21 gives the sampling activity by field and day.

TABLE 21.— SOIL MOISTURE SAMPLING ACTIVITY BY FIELD AND DAY[a]

Field no.	Julian day							
	199	200	201	202	203	220	221	223
1	—	—	X	X	X	P	—	—
2	X	—	X	X	C	X	X	P
3	X	—	X	X	P	X	X	X
4	X	—	X	X	X	X	X	X
5	C	—	X	X	X	X	X	X
6	X	—	X	X	X	X	X	X
7	X	—	X	X	X	X	X	X
8	C	—	X	X	X	X	X	X
9	X	—	X	X	X	X	X	X
10	X	—	X	X	X	X	X	X
11	X	—	X	X	X	X	X	X
12	X	—	X	X	X	X	X	X
13	X	—	X	X	X	X	X	X
14	X	—	X	X	X	X	X	X
19	X	—	—	C	C	—	—	—
20	X	—	X	P	P	—	—	—
21	X	—	X	P	P	—	—	—
22	X	—	—	—	—	—	—	—
24	X	—	—	—	—	X	X	—
25	X	—	X	X	X	X	—	X
26	X	—	X	P	P	P	—	—
27	X	—	X	X	X	X	X	X
28	—	C	—	—	—	—	P	P
29	—	C	—	P	P	P	X	X
30	—	C	—	—	P	P	X	X
31	—	C	—	—	P	X	—	—
34	C	—	—	—	C	—	X	—
37	—	C	—	C	P	X	X	X
38	—	C	C	C	—	P	X	X
39	P	—	X	—	X	X	X	X
40	X	—	—	—	C	X	P	X
43	—	C	—	—	P	X	X	X
44	X	C	X	X	X	—	P	—
45	—	—	—	—	—	X	X	X
46	X	—	X	X	X	X	X	X
47	X	—	X	—	X	X	X	X
49	X	—	X	X	X	X	X	X
50	X	—	X	X	C	X	X	X
52	X	—	X	X	X	X	X	X
53	X	—	X	X	X	X	X	—
54	X	—	X	X	X	X	X	P
55	X	—	X	X	X	—	—	—
56	—	—	—	—	—	P	P	P

[a]The following notations are used in the table:

X: Field well sampled (90 to 148 samples).
P: Partial data set (20 to 90 samples).
C: Abbreviated data set (usually core samples only; up to 20 samples).
—: No data available.



Symbol	Sample depths, cm	No. of locations	No. of samples per location	Total
•	0-1, 1-2	10	2	20
+	0-1, 1-2, 2-5	8	3	24
◬	0-1, 1-2, 2-5, 5-9, 9-15	8	5	40
⊙	0-1, 1-2, 2-5, 5-9, 9-15, 0-15	4	6	24
⦿	0-1, 1-2, 2-5, 5-9, 9-15, 0-15, 15-30, 30-45	5	8	40
Total samples				148

Figure 6.— Sample locations and depth.

4.1.2 SAMPLE PROCESSING

Soil samples were boxed and sent by truck to Agricultural Technology, Incorporated, in McCook, Nebraska. The soil samples were initially weighed within 48 hours of acquisition, then dried for 24 hours in a forced air oven at 105° to 110° C, and reweighed. Soil moisture by weight was calculated as follows:

$$\theta_g = \frac{\text{wet weight - dry weight}}{\text{dry weight}} \times 100.$$

The sampler container (metal can and lid) was weighed along with the soil sample during all weighings. After drying, the soil sample was removed, the container and lid weighed, and this weight subtracted from sample weights.

Tests were conducted at the site to determine whether loss of soil moisture from the cans, before they were weighed for the first time, would lead to unacceptable errors in the soil moisture estimates. Later, other laboratory tests were performed to investigate this question (see appendix G). All of these tests indicated that the moisture losses were minimal.

Soil moisture data are available on magnetic tape (nonlabeled EBCIDIC IBM format with 80-character card images blocked in 10 cards per record and with 9 tracks at 800 bpi). An example of the data listing is shown in table 22. Table 22 gives the soil moisture by weight and provides two columns for the times of acquisition. The appearance of only one time indicates the time the sample was taken. Time given in both the T1 and the T2 columns indicates that the exact time of sampling is uncertain but that sampling occurred between T1 and T2. The appearance of a zero in both columns indicates that the time of sampling is unknown.

4.2 BULK DENSITY

Bulk densities were measured using undisturbed core samples, from indicated depths, from locations 12, 19, 27, and 29. This was completed for 36 fields. The results are given in table 23.

TABLE 22.— SOIL MOISTURE DATA[1]

KANSAS	1978	JULIAN DAY	FIELD NUMBER	SAMPLE LOCATION	GRAVIMETRIC SOIL MOISTURE BY SAMPLE DEPTH, CM 0-1	1-2	2-5	5-8	8-15	0-15	15-30	30-45	TIME, CDT T_1	T_2
KS	8	199	2	11	190	190	181	179	178	203	0	0	1600	0
KS	8	199	2	12	220	230	235	0	0	0	0	0	1629	0
KS	8	199	2	13	175	166	177	186	213	0	0	0	1644	0
KS	8	199	2	14	208	216	218	0	0	0	0	0	1700	0
KS	8	199	2	15	214	232	242	188	251	0	0	0	1714	0
KS	8	199	2	16	32	60	103	0	0	0	0	0	1650	0
KS	8	199	2	17	146	186	183	170	204	217	167	164	1619	0
KS	8	199	2	18	197	205	205	204	197	0	0	0	1639	0
KS	8	199	2	19	202	217	210	215	210	197	223	208	1714	0
KS	8	199	2	20	197	245	258	0	0	0	0	0	1719	0
KS	8	199	2	21	111	127	138	132	138	0	0	0	1700	0
KS	8	199	2	22	98	534	149	178	171	0	0	0	1639	0
KS	8	199	2	23	115	121	209	213	195	167	174	82	1619	0
KS	8	199	2	24	62	90	163	182	209	0	0	0	1554	0
KS	8	199	2	25	118	162	193	229	259	0	0	0	1529	0
KS	8	199	2	26	0	208	208	0	0	0	0	0	1744	0
KS	8	199	2	27	101	180	136	193	197	225	191	276	1703	0
KS	8	199	2	28	95	172	219	228	229	0	0	0	1622	0
KS	8	199	2	29	0	69	199	188	92	166	0	195	1541	0
KS	8	199	2	30	79	189	196	0	0	0	0	0	1500	0
KS	8	199	3	11	73	144	154	185	188	162	0	0	1514	1729
KS	8	199	3	12	0	122	0	0	0	0	0	0	1514	1729
KS	8	199	3	13	43	353	338	339	313	0	0	0	1514	1729
KS	8	199	3	14	295	281	289	0	0	0	0	0	1514	1729
KS	8	199	3	15	314	261	246	266	271	250	0	0	1514	1729
KS	8	199	3	16	158	189	153	0	0	0	0	0	1514	1729
KS	8	199	3	17	0	255	163	118	136	121	129	129	1514	1729
KS	8	199	3	18	306	319	320	329	267	0	0	0	1514	1729
KS	8	199	3	19	210	118	319	309	307	298	240	137	1514	1729
KS	8	199	3	20	279	281	0	0	0	0	0	0	1514	1729
KS	8	199	3	26	104	189	229	0	0	0	0	0	1611	0
KS	8	199	3	27	135	189	198	185	177	160	153	141	1624	0
KS	8	199	3	28	0	702	233	232	61	0	0	0	1650	0
KS	8	199	3	29	80	0	258	270	271	200	156	39	1716	0
KS	8	199	3	30	170	222	250	0	0	0	0	0	1729	0
KS	8	199	3	31	129	213	234	232	246	217	0	0	1600	0
KS	8	199	3	32	133	583	200	0	0	0	0	0	1549	0
KS	8	199	3	33	102	158	208	217	217	0	0	0	1537	0
KS	8	199	3	34	161	195	203	0	0	0	0	0	1526	0
KS	8	199	3	35	137	195	207	215	207	201	0	0	1514	0
KS	8	199	3	36	359	0	0	0	0	0	0	0	1609	0
KS	8	199	3	37	306	260	0	0	0	0	0	0	1514	1729
KS	8	199	3	38	336	333	0	0	0	0	0	0	0	0
KS	8	199	3	39	140	184	0	0	0	0	0	0	0	0
KS	8	199	3	40	94	0	0	0	0	0	0	0	1703	0
KS	8	199	3	41	90	204	0	0	0	0	0	0	1537	0
KS	8	199	3	42	105	192	0	0	0	0	0	0	0	0
KS	8	199	3	43	72	70	0	0	0	0	0	0	0	0
KS	8	199	3	44	283	262	0	0	0	0	0	0	0	0
KS	8	199	3	45	142	211	0	0	0	0	0	0	0	0

[1] The numbers given are the percentages of soil moisture multiplied by 10.

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TABLE 23.— BULK DENSITY

[Bulk density in g/cm^3; sample depth in cm]

FIELD	LOCATION	SAMPLE DEPTH					
		0-2	2-5	5-9	9-15	15-30	30-45
1	17	1.13	1.11	1.07	1.27	1.40	1.47
1	19	1.08	1.09	1.29	1.44	1.37	1.41
1	27	1.32	1.23	0.99	1.44	[illegible]	1.39
1	29	0.94	1.17	1.41	1.42	1.25	1.32
2	17	0.98	1.03	1.01	1.02	1.06	1.37
2	19	1.06	1.06	1.23	1.26	1.34	1.45
2	27	1.12	1.06	1.13	1.23	1.27	1.44
2	29	1.02	1.16	1.13	0.96	1.05	1.28
3	17	0.96	1.02	1.06	1.22	1.31	1.51
3	19	1.03	0.99	1.13	1.25	1.26	1.30
3	27	1.19	1.36	1.22	1.23	1.27	1.27
3	29	0.98	1.02	1.06	1.25	1.39	1.24
4	17	1.02	1.05	1.01	1.24	1.30	1.28
4	19	1.20	0.99	0.99	0.95	1.28	1.32
4	27	1.05	1.11	1.12	1.30	1.37	1.22
4	29	1.22	1.29	1.12	1.23	1.42	1.21
5	17	1.09	1.21	1.30	1.30	1.25	1.28
5	19	1.24	1.26	1.26	1.20	1.43	1.55
5	27	1.13	1.22	1.29	1.25	1.32	1.45
5	29	1.16	1.23	1.28	1.25	1.33	1.43
6	17	1.19	1.04	1.08	1.42	1.34	1.39
6	19	1.17	1.10	1.05	1.24	1.40	1.37
6	27	1.17	1.12	1.01	1.34	1.30	1.42
6	29	1.19	1.07	1.06	1.36	1.35	1.37
7	17	1.32	1.27	1.18	1.31	1.27	1.36
7	19	1.08	1.05	1.30	1.26	1.33	1.37
7	27	1.18	1.13	1.13	1.21	1.30	1.21
7	29	1.24	1.18	1.13	1.16	1.31	1.31
8	17	1.02	1.14	1.06	1.07	1.19	1.33
8	19	0.96	1.20	1.16	1.05	1.25	1.37
8	27	1.17	1.17	1.19	1.26	1.19	1.28
8	29	0.95	1.21	1.18	1.02	1.26	1.19

TABLE 23.— Continued.

FIELD	LOCATION	SAMPLE DEPTH					
		0-2	2-5	5-9	9-15	15-30	30-45
9	17	1.09	1.15	1.16	1.35	1.22	1.26
9	19	1.09	1.04	1.08	1.22	1.32	1.41
9	27	0.99	1.10	1.06	1.30	1.31	1.26
9	29	1.09	1.18	1.34	1.34	1.43	1.43
10	17	0.95	1.11	1.30	1.07	1.22	1.41
10	19	1.25	1.27	1.25	1.30	1.15	1.29
10	27	1.26	1.04	1.15	1.35	1.30	1.39
10	29	1.05	1.07	1.21	1.22	1.26	1.26
11	17	1.23	1.17	1.16	1.39	1.32	1.44
11	19	1.34	1.24	1.17	1.48	1.28	1.34
11	27	1.17	1.16	1.10	1.33	1.39	1.41
11	29	1.18	1.14	1.11	1.39	1.52	1.45
12	17	0.99	1.08	1.20	1.39	1.27	1.40
12	19	1.13	1.17	1.20	1.42	1.32	1.25
12	27	1.13	1.09	1.19	1.36	1.41	1.37
12	23	1.07	1.16	1.00	1.33	1.39	1.28
13	17	1.02	0.99	1.14	1.20	1.27	1.35
13	19	0.92	0.99	1.00	1.04	1.36	1.37
13	27	1.00	1.02	0.93	1.26	1.28	1.20
13	29	0.95	1.05	1.06	1.14	1.25	1.25
14	17	1.00	1.26	1.18	1.12	1.25	1.10
14	19	1.28	1.33	1.27	1.13	1.11	1.11
14	27	1.06	1.27	1.19	1.06	1.23	1.21
14	29	0.63	1.20	1.32	1.28	1.21	1.35
19	17	0.94	1.00	1.03	1.41	1.34	1.33
19	19	0.94	1.10	1.39	1.28	1.31	1.45
19	27	1.09	1.04	1.11	1.25	1.31	1.22
19	29	1.00	0.96	1.13	1.01	1.39	1.48
20	17	[illegible]	0.97	1.00	1.02	1.31	1.36
20	19	1.18	1.07	1.16	1.14	1.30	1.29
20	27	1.28	1.23	1.28	1.18	1.39	1.48
20	29	0.96	[illegible]	1.45	1.15	1.19	1.38

TABLE 23.— Continued.

FIELD	LOCATION	SAMPLE DEPTH 0-2	2-5	5-9	9-15	15-30	30-45
21	17	1.12	1.05	1.07	1.04	1.35	1.12
21	19	1.28	1.22	1.32	1.31	1.35	1.23
21	27	1.39	1.19	1.22	1.07	1.32	1.41
21	29	1.00	1.00	1.31	1.15	1.40	1.38
22	17	0.93	0.99	0.94	1.03	1.30	1.26
22	19	1.14	1.12	1.11	1.24	1.36	1.31
22	27	1.04	1.04	1.06	1.24	1.32	1.40
22	29	1.11	1.03	1.08	1.28	1.36	1.30
24	17	1.08	1.08	1.19	1.22	1.43	1.30
24	19	1.14	1.12	1.12	1.19	1.30	1.32
24	27	1.05	1.01	0.87	1.05	1.30	1.36
24	29	1.07	1.15	1.38	1.42	1.23	1.40
25	17	0.97	1.05	1.24	1.28	1.25	1.24
25	19	1.29	1.32	1.34	1.44	1.34	1.26
25	27	1.11	1.04	1.25	1.41	1.30	1.34
25	29	1.11	1.11	1.13	1.25	1.24	1.50
26	17	1.15	1.22	0.96	1.18	1.24	1.37
26	19	1.22	1.08	1.22	1.30	1.38	1.39
26	27	1.16	1.16	1.11	1.23	1.40	1.41
26	29	1.08	1.12	1.10	1.20	1.40	1.25
27	17	1.26	1.17	1.20	1.53	1.35	1.32
27	19	1.17	1.16	1.48	1.44	1.24	1.34
27	27	1.12	1.14	1.22	1.37	1.39	1.37
27	29	1.02	1.04	1.02	1.21	1.33	1.38
28	17	1.29	1.25	1.16	1.20	1.39	1.43
28	19	1.07	1.01	1.01	1.14	1.35	1.33
28	27	0.93	1.31	0.99	1.14	1.50	1.46
28	29	0.93	1.00	1.04	1.17	1.35	1.32
37	17	1.39	1.22	1.11	1.33	1.35	1.22
37	19	0.96	0.96	1.25	1.46	1.52	1.33
37	27	1.00	1.11	1.06	1.23	1.35	1.41
37	29	1.13	1.10	1.08	1.28	1.29	1.25

TABLE 23.— Continued.

FIELD	LOCATION	SAMPLE DEPTH					
		0-2	2-5	5-9	9-15	15-30	30-45
38	17	1.11	1.14	1.37	1.42	1.30	1.40
38	19	1.02	1.08	1.24	1.46	1.32	1.33
38	27	1.09	1.09	1.09	1.26	1.38	1.41
38	29	1.05	0.83	1.10	1.22	1.21	1.34
39	17	1.42	1.37	1.50	1.56	1.40	1.38
39	19	0.93	1.07	0.94	1.45	1.21	1.43
39	27	1.30	1.26	1.21	1.21	1.34	1.59
39	29	0.98	1.03	1.08	1.45	1.41	1.15
40	17	1.21	1.20	1.09	1.19	1.30	1.38
40	19	1.35	1.21	1.32	1.37	1.34	1.34
40	27	1.19	1.24	1.28	1.43	1.31	1.23
40	29	1.16	1.06	0.87	1.34	1.12	1.31
44	17	1.11	1.09	1.20	1.19	1.23	1.21
44	19	1.25	1.36	1.36	1.43	1.19	1.20
44	27	1.25	1.12	1.34	1.54	1.32	1.20
44	29	1.33	1.28	1.33	1.46	1.24	1.16
46	17	1.17	1.22	1.25	1.46	1.25	1.36
46	19	1.16	1.10	1.12	1.25	1.30	1.26
46	27	1.24	1.21	1.36	1.42	1.27	1.31
46	29	1.18	1.27	1.32	1.36	1.25	1.27
47	17	1.18	1.06	1.18	1.29	1.25	1.30
47	19	1.44	1.41	1.01	1.38	1.25	1.32
47	27	1.49	1.47	1.47	1.44	1.40	1.37
47	29	1.17	1.26	1.38	1.50	1.44	1.19
49	17	1.02	0.94	1.01	1.27	1.36	1.28
49	19	1.07	0.97	1.00	1.30	1.33	1.40
49	27	1.03	0.98	1.02	1.30	1.40	1.34
49	29	1.12	1.06	0.98	1.26	1.36	1.28
50	17	1.21	1.07	1.24	1.42	1.26	1.29
50	19	1.09	1.12	1.09	1.30	1.27	1.35
50	27	1.03	1.09	1.09	1.32	1.36	1.30
50	29	0.96	1.22	1.01	1.27	1.25	1.23

TABLE 23.– Continued.

FIELD	LOCATION	SAMPLE DEPTH 0-2	2-5	5-9	9-15	15-30	30-45
52	17	1.05	0.98	1.18	1.39	1.44	1.44
52	19	1.12	1.[illegible]	1.17	1.21	1.32	1.44
52	27	1.02	1.07	1.10	1.39	1.[illegible]	1.49
52	29	1.00	1.04	0.95	1.14	1.28	1.38
53	17	1.21	1.00	1.30	1.44	1.33	1.22
53	19	1.25	1.11	1.11	1.26	1.24	1.33
53	27	1.13	1.13	1.30	1.24	1.29	1.27
53	29	1.15	1.11	0.99	1.17	1.26	1.28
54	17	1.09	1.00	1.00	1.19	1.39	1.42
54	19	1.08	1.19	1.13	1.39	1.34	1.41
54	27	1.18	1.20	0.99	1.36	1.44	1.42
54	29	1.18	1.17	1.04	1.25	1.35	1.37
55	17	1.12	1.09	1.23	1.25	1.20	1.29
55	19	1.19	1.05	1.35	1.23	1.33	1.32
55	27	1.00	1.33	1.35	1.47	1.32	1.29
55	29	1.19	1.14	1.36	1.41	1.26	1.41

4.3 SOIL TEMPERATURE MEASUREMENTS

Both soil thermometers and thermocouples were used to measure soil temperatures during the first set of overflights, and only thermocouples were used during the second set of overflights. Measurements were made in four fields, during each flight day, at 0.5, 1.5, 3.5, 7.0, 12.0 and 22.0 centimeter depths. Measurement locations are listed in table 24 and shown in figure 6.

All thermometers and thermocouples were calibrated in the laboratory after all flights were complete. The corrected soil temperature readings are given in table 24.

4.4 VEGETATION SAMPLES

Vegetation samples were acquired in fields with green growth. Samples consisted of three plants for corn and milo and 0.092 square meter (1 foot square) for pasture. Samples were acquired at two locations in each field. Measurements of row spacing and plant density were made for each field. Plant samples were weighed, dried, and reweighed to determine total moisture content. Moisture density was computed for each plant sample from the relation:

$$\text{Moisture density} = \frac{\text{wet weight of plant - dry weight of plant}}{\text{plant height}} = \text{plant density.}$$

The data are given in table 25.

4.5 SURFACE ROUGHNESS

Surface roughness data consist of a series of photographs. Panels 3 by 4 feet were placed edgewise in the ground so that the interface between the panel and the soil surface formed a line across the face of the panel. The panel was marked with a 2.54-centimeter (1-inch) grid. This panel was placed both perpendicularly and horizontally to row direction, or north-south and east-west for non-row fields, and was photographed. An example of the photograph is shown in figure 7.

Surface roughness photographs were acquired from fields 1 through 14, 20, 31, 37, 39, 40, 44, 46, 47, 49, 50, 52, and 53.

TABLE 24.— ASME GROUND-TRUTH TEMPERATURE DATA FOR THOMAS COUNTY, KANSAS

[Temperature values in °C; depths in cm]

(a) Field 3

YEAR	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0	
78	199	23	1050	22.6	22.7	22.6	23.2	24.4	23.8	*
78	199	23	1430	36.1	30.8	29.5	27.1	25.2	25.5	*
78	199	23	1450	33.9	31.3	29.0	27.1	-	-	*
78	199	23	1630	32.6	29.8	28.4	27.1	-	-	*
78	202	23	1235	31.7	24.5	23.6	22.8	-	-	*
78	202	23	1235	28.2	28.0	26.8	25.4	-	-	*
78	202	23	1610	29.8	27.8	29.5	28.3	-	-	
78	203	23	1118	24.4	20.5	22.4	21.0	-	-	*
78	203	23	1121	24.2	21.3	-	-	-	-	
78	203	23	1310	24.4	25.2	26.2	22.7	-	-	*
78	203	23	1313	31.2	22.5	-	-	-	-	
78	203	23	1445	27.9	29.8	26.5	23.8	-	-	*
78	203	23	1450	25.9	24.5	26.5	27.5	22.7	22.3	
78	203	23	1610	23.5	25.6	24.9	23.8	22.5	-	*
78	203	23	1615	27.7	25.7	26.4	25.7	23.3	22.5	
78	220	38	1325	28.6	24.2	27.1	28.0	-	-	
78	220	38	1600	33.6	24.8	27.2	26.6	22.6	-	
78	220	39	1250	23.4	23.2	22.5	20.5	-	-	
78	220	39	1545	25.4	24.7	24.5	22.2	-	-	
78	220	42	1240	24.0	24.6	-	19.9	-	-	
78	220	42	1540	25.6	26.3	-	22.6	-	-	
78	220	43	1310	26.8	23.4	23.4	22.4	-	-	
78	220	43	1555	25.6	23.9	24.2	-	-	-	
78	220	44	1305	24.3	23.0	23.9	22.1	21.4	19.6	
78	220	44	1550	32.2	24.1	25.2	23.2	21.9	20.1	
78	220	45	1230	22.9	26.2	23.2	19.4	20.3	19.3	
78	220	45	1535	25.4	25.6	24.7	21.5	22.9	19.6	
78	221	38	1135	24.6	22.0	23.6	28.6	-	-	
78	221	38	1215	28.1	22.5	25.7	26.2	-	-	
78	221	38	1525	23.5	24.0	25.6	29.0	-	-	
78	221	38	1600	23.3	23.6	25.8	29.0	-	-	
78	221	39	1130	21.5	20.9	21.1	19.5	-	-	
78	221	39	1210	22.2	22.0	22.0	20.1	-	-	
78	221	39	1520	24.2	23.7	23.7	22.1	-	-	
78	221	39	1555	23.9	23.5	23.5	22.0	-	-	
78	221	42	1120	21.4	21.3	-	19.5	-	-	
78	221	42	1200	23.7	22.0	-	19.9	-	-	
78	221	42	1510	25.2	25.1	-	21.9	-	-	
78	221	42	1545	24.6	24.9	-	22.0	-	-	
78	221	43	1145	21.9	20.7	20.3	19.4	-	-	
78	221	43	1225	22.6	21.4	20.9	20.2	-	-	
78	221	43	1535	24.4	23.4	23.1	22.6	-	-	
78	221	43	1610	24.5	22.9	22.9	22.4	-		
78	221	44	1140	24.8	20.6	20.9	19.8	19.3	20.2	
78	221	44	1220	24.4	21.4	21.7	20.4	19.6	-	
78	221	44	1530	24.0	23.6	23.9	23.2	21.6	-	
78	221	44	1605	23.8	22.7	24.0	22.9	20.9	-	
78	221	45	1125	21.0	21.2	20.6	19.2	19.6	19.6	
78	221	45	1205	22.7	23.8	21.4	19.6	20.2	19.6	
78	221	45	1515	24.1	24.6	23.6	21.4	22.2	19.9	
78	221	45	1550	23.9	24.4	23.6	21.3	22.1	19.9	
78	223	38	635	17.5	17.1	17.1	17.0	-	-	
78	223	38	710	16.5	16.9	16.9	16.0	-	-	

* MEASUREMENT BY THERMOMETER
\- MISSING OR DELETED DATA

TABLE 24.— Continued.

(a) Field 3, concluded

YEAR	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0
78	223	38	915	19.1	18.4	18.7	19.6	-	-
78	223	39	630	16.4	17.5	17.7	18.9	-	-
78	223	39	705	16.0	17.3	17.7	18.9	-	-
78	223	39	910	18.5	18.4	18.4	18.8	-	-
78	223	42	620	17.9	17.7	-	19.4	-	-
78	223	42	655	17.8	17.6	-	19.4	-	-
78	223	42	900	18.6	18.6	-	19.2	-	-
78	223	43	645	16.8	17.6	17.4	18.2	-	-
78	223	43	720	16.6	17.4	17.1	17.9	-	-
78	223	43	925	18.4	18.3	18.1	17.9	-	-
78	223	44	640	17.1	17.6	17.2	18.4	19.0	-
78	223	44	715	16.8	17.5	16.9	18.2	18.9	-
78	223	44	920	18.4	18.4	18.3	18.5	18.9	-
78	223	45	625	16.9	17.3	17.4	19.0	18.5	19.6
78	223	45	700	16.3	17.1	17.4	18.9	18.5	19.6
78	223	45	905	18.4	18.3	18.3	18.9	18.6	19.4

* MEASUREMENT BY THERMOMETER
- MISSING OR DELETED DATA

TABLE 24.— Continued.

(b) Field 4

YEAR	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0	
78	199	23	1150	36.3	34.5	30.3	31.7	32.1	-	*
78	199	23	1230	51.9	46.7	37.6	32.3	30.1	-	*
78	199	23	1520	60.6	51.4	40.0	34.1	31.2	29.1	*

* MEASUREMENT BY THERMOMETER
\- MISSING OR DELETED DATA

TABLE 24.— Continued.

(c) Field 7

YEAR	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0	
78	199	23	1205	49.9	38.7	28.3	28.2	30.5	-	*
78	199	23	1230	47.7	41.9	30.0	30.1	29.6	-	*
78	199	23	1605	58.8	54.3	38.2	36.1	33.0	-	*
78	201	17	1113	28.9	30.2	27.6	26.8	26.2	26.2	
78	201	18	1106	29.6	27.5	26.9	26.3	25.5	26.4	
78	201	19	1121	30.0	29.3	30.1	31.2	29.2	26.5	
78	201	23	1100	28.1	27.5	25.4	23.2	25.9	-	*
78	201	23	1100	27.4	28.7	27.2	31.8	-	26.5	
78	201	28	1055	30.1	28.1	27.2	26.5	26.2	-	
78	201	29	1047	27.9	26.6	26.5	-	26.3	26.7	
78	202	17	1120	23.5	25.6	23.5	23.6	24.1	25.3	
78	202	18	1110	25.9	22.8	23.1	23.4	25.2	25.0	
78	202	18	1540	33.0	32.4	32.8	31.5	27.9	26.0	
78	202	19	1535	33.9	34.0	33.4	30.5	27.7	26.3	
78	202	23	1130	22.3	23.1	23.4	23.3	-	-	*
78	202	23	1132	23.9	24.5	24.6	23.2	-	25.0	
78	202	28	1140	27.9	25.5	24.6	24.5	24.6	-	
78	202	29	1150	25.6	25.4	25.6	-	24.4	28.2	
78	203	17	1025	21.9	22.8	21.3	20.8	20.8	21.3	
78	203	17	1209	25.1	26.0	25.0	23.5	22.7	22.4	
78	203	17	1350	29.8	30.0	29.6	26.8	24.8	25.3	
78	203	17	1525	30.4	31.5	30.8	28.4	25.9	25.0	
78	203	18	1020	23.6	21.9	20.7	20.1	21.1	23.1	
78	203	18	1204	26.6	26.3	24.5	22.9	22.1	23.0	
78	203	18	1345	31.2	29.9	28.1	26.3	23.4	23.2	
78	203	18	1521	31.3	30.4	28.8	28.2	24.9	23.6	
78	203	19	1012	21.5	22.3	21.0	20.3	22.7	23.0	
78	203	19	1155	25.4	29.7	25.5	22.1	-	22.8	
78	203	19	1332	29.1	31.9	29.1	24.7	23.3	23.1	
78	203	19	1515	30.1	33.1	29.9	25.6	35.5	23.1	
78	203	23	1032	22.9	22.2	21.1	19.9	-	-	*
78	203	23	1037	21.7	22.9	22.2	21.4	-	22.6	
78	203	23	1215	26.5	26.3	22.7	-	-	-	*
78	203	23	1220	26.3	27.8	26.2	24.2	-	23.2	
78	203	23	1332	29.3	31.6	25.7	24.5	-	-	*
78	203	23	1400	33.0	33.9	30.9	27.0	-	24.0	
78	203	23	1532	30.7	31.6	26.6	25.9	25.3	-	*
78	203	23	1535	29.4	28.8	29.7	27.1	-	24.9	
78	203	28	1045	-	22.3	21.0	20.9	21.0	-	
78	203	28	1228	33.9	25.2	23.8	22.9	21.8	-	
78	203	28	1406	41.7	31.5	28.8	26.0	23.2	-	
78	203	28	1540	34.3	29.4	38.3	26.9	24.2	-	
78	203	29	1050	23.7	22.3	21.6	-	21.0	24.4	
78	203	29	1240	28.7	25.9	24.8	-	22.3	28.9	
78	203	29	1412	32.0	30.3	28.4	-	24.0	28.2	
78	203	29	1545	31.3	29.4	29.0	-	25.2	26.7	
78	220	13	1055	-	25.6	23.4	21.3	-	-	
78	220	13	1405	47.6	47.1	34.3	32.3	25.7	-	
78	220	17	1100	34.9	31.6	24.9	-	-	-	
78	220	17	1410	44.0	44.2	32.6	-	-	-	
78	220	18	1105	45.4	34.3	31.1	24.6	22.2	-	
78	220	18	1415	44.9	42.5	30.1	25.8	-	-	
78	220	19	1050	31.2	28.8	26.3	22.8	-	-	
78	220	19	1400	43.6	40.2	34.1	31.2	-	-	
78	220	22	1115	40.1	37.8	27.7	23.6	22.7	-	

* MEASUREMENT BY THERMOMETER
- MISSING OR DELETED DATA

TABLE 24.— Continued.

(c) Field 7, concluded

YEAR	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0
78	220	22	1425	48.0	38.9	31.9	27.8	25.2	-
78	220	23	1110	-	37.3	29.6	26.6	23.0	23.1
78	220	23	1420	55+	55+	39.2	34.9	27.7	22.7
78	220	24	1140	42.4	25.4	25.7	23.0	-	-
78	220	24	1445	44.5	49.5	36.6	34.5	26.2	-
78	220	27	1120	38.0	37.4	29.7	23.9	-	-
78	220	27	1430	55+	55+	35.6	27.6	-	-
78	220	28	1125	42.1	34.9	27.6	23.6	-	23.3
78	220	28	1435	55+	47.6	37.0	27.6	-	24.8
78	220	29	1130	28.1	36.5	30.3	23.0	-	-
78	220	29	1440	35.9	49.6	38.0	34.1	-	-
78	221	13	1015	35.7	33.2	23.1	22.2	21.4	-
78	221	13	1320	55+	55+	33.2	31.0	25.6	-
78	221	13	1435	47.1	49.6	35.6	33.7	27.4	-
78	221	17	1020	28.3	26.9	23.2	-	-	-
78	221	17	1325	44.2	43.8	31.1	-	-	-
78	221	17	1440	44.6	46.0	33.5	55+	-	-
78	221	18	1025	28.4	-	22.9	22.1	-	-
78	221	18	1330	44.9	55+	29.1	25.6	-	-
78	221	18	1445	45.9	55+	30.7	27.1	55+	-
78	221	19	1010	25.8	25.2	22.1	-	-	-
78	221	19	1315	42.2	39.6	32.2	-	-	-
78	221	19	1430	45.1	40.9	35.1	-	-	-
78	221	22	1035	28.5	29.6	23.7	22.1	22.2	-
78	221	22	1340	55+	37.0	31.7	25.8	24.8	-
78	221	23	1030	37.1	30.6	25.7	23.7	22.6	23.3
78	221	23	1335	55+	55+	37.9	33.2	27.0	23.2
78	221	24	1055	28.6	30.5	23.9	23.2	22.4	-
78	221	24	1400	42.9	49.7	35.7	32.7	25.6	-
78	221	27	1040	34.2	30.4	25.5	22.6	-	-
78	221	27	1345	55+	45.4	36.3	26.8	-	-
78	221	28	1045	34.6	29.9	24.4	22.6	-	23.2
78	221	28	1350	45.0	40.6	33.5	27.0	-	24.8
78	221	29	1050	-	29.1	26.0	22.5	-	-
78	221	29	1355	37.3	48.7	36.9	32.0	-	-
78	223	13	515	16.6	15.4	21.6	22.1	23.1	-
78	223	13	750	17.9	17.4	20.6	20.9	22.3	-
78	223	13	940	36.1	34.2	22.6	21.7	22.2	-
78	223	17	520	19.4	19.0	21.9	-	-	-
78	223	18	525	19.1	-	22.9	24.1	-	-
78	223	19	510	16.1	19.9	20.9	20.6	-	-
78	223	22	535	18.2	19.2	21.7	23.1	23.9	-
78	223	22	820	20.1	20.8	21.1	22.4	23.2	-
78	223	22	950	29.1	29.1	24.5	22.6	23.0	-
78	223	23	530	17.0	18.5	21.4	22.5	24.3	25.4
78	223	23	815	-	19.0	20.7	21.4	23.3	24.8
78	223	23	945	-	29.1	24.6	23.1	23.1	24.3
78	223	24	555	18.9	17.2	20.6	21.9	24.2	-
78	223	24	833	-	-	20.6	21.1	23.4	-
78	223	24	955	-	-	22.6	22.7	23.1	-
78	223	27	540	18.0	19.4	21.5	23.8	-	-
78	223	28	545	15.8	20.0	-	23.9	-	25.6
78	223	29	550	17.6	19.2	20.5	22.1	-	-

* MEASUREMENT BY THERMOMETER
\- MISSING OR DELETED DATA

TABLE 24.– Continued.

(d) Field 8

YEAR	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0	
78	199	23	1320	49.8	37.8	38.6	30.7	31.5	-	*
78	199	23	1615	39.3	40.6	41.9	35.0	31.0	-	*
78	199	23	1650	47.0	40.6	42.7	35.5	31.5	-	*
78	201	17	1158	-	-	-	29.1	27.2	27.3	
78	201	17	1303	-	-	-	31.3	28.6	27.2	
78	201	17	1407	-	-	-	33.3	30.3	27.5	
78	201	17	1517	-	-	-	34.4	32.1	28.1	
78	201	18	1155	-	-	-	-	-	26.7	
78	201	18	1300	-	-	-	-	-	26.7	
78	201	18	1404	-	-	-	-	-	26.8	
78	201	18	1515	-	-	-	-	-	27.2	
78	201	19	1203	-	31.2	29.1	29.4	26.6	26.6	
78	201	19	1306	-	33.9	32.3	32.0	26.8	26.5	
78	201	19	1410	-	36.8	34.9	33.9	27.6	26.6	
78	201	19	1521	-	37.7	36.2	35.2	28.4	26.8	
78	201	23	1152	-	-	38.0	28.0	26.5	27.0	
78	201	23	1257	-	-	38.0	30.1	26.8	26.8	
78	201	23	1402	-	-	41.4	32.1	27.4	26.7	
78	201	23	1512	-	-	42.2	33.5	28.5	27.1	
78	201	28	1147	32.3	-	30.0	29.5	27.4	28.3	
78	201	28	1254	36.5	-	33.5	33.1	28.0	28.0	
78	201	28	1359	40.5	-	35.8	35.1	29.0	27.8	
78	201	28	1508	42.2	-	37.9	36.8	30.5	28.1	
78	201	29	1145	29.7	29.8	28.7	-	26.6	26.9	
78	201	29	1251	-	-	32.3	-	27.4	27.2	
78	201	29	1356	-	-	34.5	-	28.4	27.8	
78	201	29	1505	-	-	36.0	-	30.4	29.1	
78	202	17	1045	-	-	-	24.0	24.6	26.6	
78	202	17	1124	-	-	-	23.9	24.3	26.3	
78	202	17	1152	-	-	-	24.4	24.5	26.1	
78	202	17	1240	-	-	-	25.6	25.1	26.0	
78	202	17	1402	-	-	-	27.4	26.6	26.0	
78	202	17	1447	-	32.6	30.2	29.1	27.4	26.4	
78	202	18	1043	-	-	-	-	-	26.9	
78	202	18	1122	-	-	-	-	-	26.2	
78	202	18	1149	-	-	-	-	-	26.0	
78	202	18	1238	-	-	-	-	-	25.9	
78	202	18	1357	-	-	-	-	-	25.9	
78	202	18	1443	33.9	29.4	-	-	-	25.9	
78	202	19	1048	-	23.1	23.2	23.4	25.4	26.5	
78	202	19	1127	-	23.8	23.7	23.9	25.0	26.0	
78	202	19	1155	-	26.6	25.0	26.0	24.9	25.9	
78	202	19	1243	-	28.6	26.6	26.9	25.0	25.7	
78	202	19	1406	-	29.6	28.1	28.3	25.7	25.2	
78	202	19	1452	-	31.7	29.9	30.4	26.3	25.9	
78	202	23	1040	-	-	23.4	24.8	26.6	26.7	
78	202	23	1119	-	-	25.1	24.0	24.9	26.4	
78	202	23	1147	-	-	32.5	24.2	24.6	26.2	
78	202	23	1236	-	-	31.7	25.2	24.7	26.0	
78	202	23	1352	-	-	28.2	27.1	25.6	26.0	
78	202	23	1440	31.4	-	29.3	27.7	26.0	25.9	
78	202	28	1037	23.8	-	23.9	24.6	26.1	27.2	
78	202	28	1117	24.4	-	24.0	23.9	25.5	26.8	
78	202	28	1145	26.6	-	24.5	25.1	25.2	26.6	
78	202	28	1234	29.8	-	26.3	27.2	25.4	28.4	
78	202	28	1336	30.7	-	29.0	29.1	26.4	27.0	

* MEASUREMENT BY THERMOMETER
- MISSING OR DELETED DATA

TABLE 24.— Continued.

(d) Field 8, continued

YEAR	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0
78	202	28	1437	33.4	-	30.0	29.9	26.8	26.4
78	202	29	1033	-	-	-	23.9	24.5	25.3
78	202	29	1114	-	-	-	23.5	24.5	25.1
78	202	29	1142	-	-	-	24.2	24.4	25.0
78	202	29	1231	-	-	-	26.1	24.7	24.9
78	202	29	1330	-	-	-	27.5	26.0	25.7
78	202	29	1433	30.3	30.1	28.8	27.1	26.5	26.3
78	203	17	929	-	22.8	20.5	21.0	21.5	24.4
78	203	17	1055	-	30.0	22.3	22.4	22.1	24.2
78	203	17	1237	-	33.7	26.0	25.2	23.5	24.1
78	203	17	1348	-	33.8	28.0	27.3	25.1	24.1
78	203	17	1536	-	30.7	29.5	28.9	26.6	24.8
78	203	18	926	20.0	20.4	-	-	-	24.9
78	203	18	1051	23.0	21.5	-	-	-	24.4
78	203	18	1233	26.6	24.6	-	-	-	24.4
78	203	18	1346	29.4	26.0	-	-	-	24.3
78	203	18	1530	28.7	27.0	-	-	-	24.8
78	203	19	933	-	21.0	20.2	20.4	23.2	24.9
78	203	19	1058	-	23.8	22.2	22.7	23.2	24.7
78	203	19	1242	-	27.9	25.4	26.2	23.6	24.3
78	203	19	1352	-	29.5	27.2	27.9	24.1	24.3
78	203	19	1543	-	33.0	28.8	29.3	25.5	24.5
78	203	23	923	21.4	-	19.9	21.2	22.9	24.9
78	203	23	1048	23.0	-	26.7	21.7	22.9	24.5
78	203	23	1230	29.3	-	24.9	23.4	23.5	24.5
78	203	23	1343	31.8	-	26.9	24.9	24.2	24.3
78	203	23	1524	31.8	-	28.1	26.5	25.6	24.6
78	203	28	921	20.6	-	20.6	20.2	22.2	24.3
78	203	28	1045	23.1	-	22.1	21.7	22.3	24.1
78	203	28	1227	29.1	-	25.6	25.7	22.9	23.9
78	203	28	1340	31.4	-	28.2	27.0	24.0	24.0
78	203	28	1517	30.7	-	29.6	26.9	25.9	24.6
78	203	29	918	20.3	19.1	19.9	20.7	21.5	22.5
78	203	29	1042	21.9	21.0	21.3	21.3	21.8	22.4
78	203	29	1224	26.3	25.0	24 4	22.7	22.5	22.6
78	203	29	1337	28.3	27.5	26.5	24.1	23.3	23.1
78	203	29	1508	28.9	28.4	28.0	25.9	25.1	24.4
78	220	13	1148	-	46.2	32.3	-	-	-
78	220	13	1345	-	51.9	-	32.3	-	-
78	220	13	1455	-	53.0	-	34.4	-	-
78	220	17	1153	43.1	45.1	45.8	44.9	-	-
78	220	17	1349	60.4	46.1	39.6	29.9	-	-
78	220	17	1501	51.9	45.9	41.6	32.0	-	-
78	220	18	1158	48.4	45.0	31.2	26.4	-	-
78	220	18	1355	48.9	45.7	36.4	30.2	-	-
78	220	18	1505	52.8	49.4	38.4	32.2	-	-
78	220	19	1142	38.1	42.4	-	26.6	24.3	-
78	220	19	1339	52.4	48.4	-	31.4	27.0	-
78	220	19	1448	53.8	49.2	-	34.9	28.2	-
78	220	22	1208	44.3	41.8	40.5	27.4	-	-
78	220	22	1408	58.7	44.9	43.1	31.1	-	-
78	220	22	1521	59.5	46.7	43.8	33.0	-	-
78	220	23	1203	43.1	36.2	31.3	26.5	24.1	23.8
78	220	23	1403	49.2	49.7	37.3	30.2	26.8	23.9
78	220	23	1512	51.6	43.5	37.9	31.9	26.2	24.3
78	220	24	1231	47.6	51.6	31.8	27.0	25.3	-
78	220	24	1427	57.2	47.8	35.9	31.9	38.2	-
78	220	24	1546	56.4	42.7	37.3	34.4	29.9	-

* MEASUREMENT BY THERMOMETER
- MISSING OR DELETED DATA

TABLE 24.— Continued.

(d) Field 8, continued

YEAR	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0
78	220	27	1212	45.8	38.4	-	34.2	-	-
78	220	27	1411	53.3	44.3	-	39.1	-	-
78	220	27	1525	51.0	45.4	-	41.3	-	-
78	220	28	1220	44.7	39.8	35.1	33.7	25.2	-
78	220	28	1417	59.6	52.4	39.4	32.4	27.8	-
78	220	28	1531	52.4	47.4	41.8	37.7	34.7	-
78	220	29	1225	58.8	41.2	44.7	25.8	-	-
78	220	29	1420	47.9	43.9	43.1	28.2	-	-
78	220	29	1537	55.3	50.2	49.6	31.0	-	-
78	221	13	1043	-	35.7	30.7	25.7	-	-
78	221	13	1205	-	46.8	33.7	29.1	-	-
78	221	13	1335	-	49.0	38.5	33.6	-	-
78	221	13	1516	-	42.2	40.9	35.2	-	-
78	221	17	1046	38.7	32.5	29.0	24.3	-	-
78	221	17	1208	42.9	39.7	35.5	26.6	-	-
78	221	17	1340	42.6	44.0	40.9	30.1	-	-
78	221	17	1521	34.4	35.7	35.8	29.4	-	-
78	221	18	1051	35.0	36.0	27.6	24.6	-	-
78	221	18	1212	42.8	47.0	37.9	27.0	-	-
78	221	18	1347	52.5	50.2	44.7	30.6	-	-
78	221	18	1527	49.3	51.9	44.4	27.5	-	-
78	221	19	1035	30.2	32.8	-	24.5	23.9	-
78	221	19	1201	40.0	35.7	-	27.9	25.7	-
78	221	19	1331	47.7	39.9	-	31.9	27.9	-
78	221	19	1512	40.2	39.5	-	33.8	31.3	-
78	221	22	1104	35.8	34.0	34.1	45.1	-	-
78	221	22	1221	42.4	40.5	39.9	29.1	-	-
78	221	22	1406	44.5	41.8	40.2	29.5	-	-
78	221	22	1539	47.9	44.2	38.1	31.9	-	-
78	221	23	1057	38.3	-	40.8	24.4	23.8	24.3
78	221	23	1218	46.6	-	42.3	26.8	25.1	24.3
78	221	23	1401	45.8	-	42.8	30.1	27.0	-
78	221	23	1535	41.4	-	43.8	33.9	26.2	-
78	221	24	1129	42.9	46.7	28.5	34.3	40.1	-
78	221	24	1240	53.6	45.0	32.4	36.1	43.3	-
78	221	24	1425	61.7	46.5	36.1	43.1	30.4	-
78	221	27	1110	46.4	40.1	-	30.3	-	-
78	221	27	1225	53.4	48.3	-	35.0	-	-
78	221	27	1412	54.8	51.9	-	38.6	-	-
78	221	27	1543	48.5	50.3	-	35.6	-	-
78	221	28	1115	38.3	39.0	[illegible]1.9	27.7	26.3	-
78	221	28	1231	45.0	42.4	-	31.6	29.1	-
78	221	28	1416	50.0	45.1	-	37.4	32.4	-
78	221	28	1548	39.9	41.4	-	33.4	29.5	-
78	221	29	1121	37.7	38.4	32.3	24.6	-	-
78	221	29	1235	41.2	39.6	32.9	25.9	-	-
78	221	29	1420	42.8	43.2	37.1	26.9	-	-
78	223	13	555	-	-	19.8	22.7	23.9	-
78	223	13	709	-	16.5	18.1	23.1	-	-
78	223	13	806	-	-	18.9	23.2	-	-
78	223	17	600	15.7	-	-	20.2	-	-
78	223	17	713	16.7	17.8	18.6	23.2	-	-
78	223	17	806	19.3	20.6	20.5	23.0	-	-
78	223	18	607	15.8	15.3	-	23.3	-	-
78	223	18	728	18.7	18.7	19.2	22.8	-	-
78	223	18	813	20.7	19.8	19.7	22.6	-	-
78	223	19	549	-	-	-	24.0	24.6	-
78	223	19	705	17.6	16.6	-	23.0	23.9	-

* MEASUREMENT BY THERMOMETER
- MISSING OR DELETED DATA

TABLE 24.– Continued.

(d) Field 8, concluded

YEAR	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0
78	223	19	803	19.3	19.6	-	22.5	20.0	-
78	223	22	616	16.1	18.3	18.7	22.5	-	-
78	223	22	735	18.3	19.4	18.4	22.5	-	-
78	223	22	824	21.9	21.1	21.1	22.6	-	-
78	223	23	612	15.7	-	20.0	24.7	17.8	21.3
78	223	23	733	18.9	-	19.6	20.4	24.4	25.8
78	223	23	819	21.2	-	21.0	23.0	24.3	25.7
78	223	24	642	16.8	-	22.4	20.8	24.1	-
78	223	24	755	-	17.7	22.2	21.0	21.7	-
78	223	24	840	23.0	22.4	22.8	23.0	19.9	-
78	223	27	622	18.8	19.4	-	21.6	-	-
78	223	27	740	19.3	19.5	-	21.7	-	-
78	223	27	829	21.5	20.7	-	22.2	-	-
78	223	28	632	18.6	17.5	-	22.0	19.2	-
78	223	28	745	17.3	20.3	-	22.3	22.9	-
78	223	28	833	23.8	22.0	-	22.7	22.6	-
78	223	29	637	18.7	16.5	17.3	20.9	-	-
78	223	29	749	19.6	18.5	18.5	23.9	-	-
78	223	29	835	22.6	22.3	19.9	24.3	-	-

* MEASUREMENT BY THERMOMETER
- MISSING OR DELETED DATA

TABLE 24.— Continued.

(e) Field 9

YEAR	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0
78	201	17	1229	32.1	33.2	30.8	27.7	26.2	25.8
78	201	17	1332	34.1	35.3	33.2	29.2	26.6	25.5
78	201	17	1442	36.5	37.9	35.9	31.5	28.1	25.9
78	201	17	1549	36.9	37.7	37.3	32.9	29.3	26.4
78	201	18	1226	33.6	31.7	30.6	28.5	-	24.3
78	201	18	1328	35.6	34.4	33.7	30.5	26.7	24.2
78	201	18	1439	38.5	37.2	34.2	33.0	28.7	24.6
78	201	18	1546	37.8	37.4	34.9	34.3	30.3	25.0
78	201	19	1233	31.8	32.1	30.3	29.2	-	-
78	201	19	1335	33.9	34.6	33.2	32.0	-	-
78	201	19	1445	36.6	36.1	35.5	34.4	-	-
78	201	19	1553	35.5	35.4	37.6	35.0	-	-
78	201	23	1223	34.7	32.9	31.0	28.2	26.4	24.7
78	201	23	1325	39.0	35.4	33.0	30.7	27.8	24.4
78	201	23	1430	43.2	38.4	36.8	32.8	29.8	24.7
78	201	23	1543	44.3	39.6	37.4	33.6	31.5	25.1
78	201	28	1220	33.1	31.8	30.6	28.1	-	24.4
78	201	28	1323	35.6	34.4	33.7	29.9	-	24.2
78	201	28	1433	38.2	37.3	35.6	31.9	-	24.4
78	201	28	1540	38.8	38.2	36.9	33.0	-	24.9
78	201	29	1217	34.2	35.2	36.0	31.2	24.4	-
78	201	29	1320	38.9	38.2	35.6	34.1	24.6	-
78	201	29	1430	35.6	42.3	39.9	36.9	25.3	-
78	201	29	1537	45.6	40.4	41.2	37.6	26.3	-
78	202	17	1415	29.7	29.2	28.5	26.9	25.6	24.6
78	202	17	1524	30.6	30.8	31.1	27.8	26.4	24.8
78	202	18	1424	31.5	30.3	28.6	-	33.5	26.5
78	202	18	1521	33.5	32.0	30.7	29.5	27.1	-
78	202	19	1100	23.0	23.7	23.6	23.6	24.9	25.6
78	202	19	1435	31.4	30.0	29.1	30.2	-	-
78	202	19	1528	31.2	32.0	30.5	31.0	-	-
78	202	23	1410	30.7	29.8	29.3	27.4	26.6	24.7
78	202	23	1518	37.4	32.8	31.6	29.0	27.0	24.2
78	202	28	1400	29.1	36.3	28.8	27.7	-	24.1
78	202	28	1515	32.8	32.0	30.3	28.7	-	23.9
78	202	29	1350	29.1	30.0	29.6	29.0	24.3	-
78	202	29	1512	33.4	34.0	32.4	31.1	24.9	-
78	203	17	1002	20.1	20.0	20.4	20.1	20.7	22.3
78	203	17	1132	24.8	24.2	22.4	21.1	21.1	22.2
78	203	17	1312	26.7	26.8	25.3	22.9	22.0	22.3
78	203	17	1433	27.2	27.2	25.8	23.8	22.8	22.4
78	203	17	1622	26.4	26.1	25.9	25.5	24.3	23.0
78	203	18	959	21.5	20.9	19.9	19.1	19.8	-
78	203	18	1129	25.0	22.9	21.4	20.9	20.9	-
78	203	18	1309	31.5	26.5	24.7	24.3	22.7	-
78	203	18	1430	33.7	28.5	26.6	26.8	24.2	-
78	203	18	1616	32.0	30.3	29.1	30.5	26.5	-
78	203	19	1006	21.4	21.8	19.7	20.8	-	-
78	203	19	1135	24.5	25.2	21.5	23.9	-	-
78	203	19	1315	27.2	27.6	24.0	26.5	-	-
78	203	19	1436	27.4	27.6	25.0	26.4	-	-
78	203	19	1627	26.6	25.9	26.8	25.4	-	-
78	203	23	955	22.7	21.2	21.3	20.5	20.8	22.6
78	203	23	1126	25.0	23.2	22.1	21.9	21.2	22.3
78	203	23	1306	30.6	27.0	25.3	24.6	22.7	22.3
78	203	23	1427	33.7	28.9	27.1	25.5	24.2	22.4

* MEASUREMENT BY THERMOMETER
\- MISSING OR DELETED DATA

TABLE 24.— Continued.

(e) Field 9, continued

TIME	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0
78	203	23	1611	33.1	32.9	30.3	27.5	26.5	22.9
78	203	28	952	22.4	19.7	20.0	20.0	-	22.2
78	203	28	1123	24.3	21.4	21.5	21.3	-	22.0
78	203	28	1303	28.8	25.3	24.4	23.9	-	22.1
78	203	28	1424	28.7	26.4	24.8	24.5	-	22.4
78	203	28	1606	29.6	27.7	26.2	25.5	-	22.6
78	203	29	948	22.0	21.3	20.4	20.0	20.5	-
78	203	29	1120	21.9	21.8	22.8	21.8	20.9	-
78	203	29	1300	26.0	25.8	26.5	24.3	21.7	-
78	203	29	1421	27.4	25.7	27.3	25.0	22.3	-
78	203	29	1600	26.5	29.0	27.1	28.0	23.1	-
78	220	13	1032	39.1	31.8	27.7	23.4	22.4	-
78	220	13	1311	55.3	42.9	33.8	28.4	24.7	-
78	220	13	1428	56.4	45.1	35.6	30.5	26.2	-
78	220	13	1515	54.1	44.7	35.8	31.4	26.8	-
78	220	17	1038	38.8	33.7	27.6	23.3	22.5	-
78	220	17	1316	50.5	43.1	36.7	27.3	27.0	-
78	220	17	1433	57.6	45.3	39.4	29.2	29.3	-
78	220	17	1519	52.0	45.2	40.0	30.0	30.4	-
78	220	18	1044	40.2	34.4	27.7	25.3	23.3	25.6
78	220	18	1322	53.4	47.0	35.4	30.6	26.2	24.4
78	220	18	1437	55.9	50.9	37.6	32.6	27.5	26.9
78	220	18	1522	56.3	51.7	37.9	33.4	28.1	27.6
78	220	19	1026	30.1	26.6	26.5	24.3	22.5	-
78	220	19	1306	37.7	35.5	35.0	28.9	25.6	-
78	220	19	1419	40.7	38.0	37.4	30.4	26.8	-
78	220	19	1512	41.1	38.6	37.9	31.3	27.7	-
78	220	22	1056	37.6	34.8	27.7	-	23.4	22.9
78	220	22	1333	49.7	45.4	43.6	-	30.5	-
78	220	22	1445	51.1	47.7	36.9	48.3	26.6	-
78	220	22	1529	51.0	47.9	37.4	-	27.3	23.5
78	220	23	1050	38.8	38.2	29.1	25.9	23.2	23.1
78	220	23	1327	49.1	45.9	34.5	30.8	25.2	25.1
78	220	23	1441	52.3	46.9	36.5	32.7	26.7	26.7
78	220	23	1525	52.5	47.8	36.7	33.2	26.8	26.9
78	220	24	1119	49.6	-	32.4	26.7	23.1	22.4
78	220	24	1356	50.8	-	39.6	31.9	25.5	22.6
78	220	24	1502	51.9	38.2	40.5	33.0	26.5	23.1
78	220	24	1548	50.7	-	40.4	33.3	27.0	23.7
78	220	27	1103	43.1	35.2	31.0	25.4	23.7	-
78	220	27	1337	53.2	43.8	39.5	30.0	26.2	-
78	220	27	1449	54.4	45.7	41.4	31.7	27.5	-
78	220	27	1533	54.4	45.7	42.2	32.5	28.2	-
78	220	28	1109	48.4	37.3	26.7	25.2	-	23.0
78	220	28	1344	56.1	45.9	33.5	30.5	-	23.5
78	220	28	1453	56.5	47.3	35.5	32.5	-	24.3
78	220	28	1540	54.1	47.0	36.2	33.3	-	24.6
78	220	29	1114	46.3	36.9	26.6	27.3	24.2	-
78	220	29	1351	41.8	47.6	31.5	32.3	25.7	-
78	220	29	1458	43.6	36.4	33.7	34.0	26.8	-
78	220	29	1544	43.1	43.8	35.5	34.7	27.2	-
78	221	13	1044	39.6	32.0	27.1	23.9	23.0	-
78	221	13	1141	46.1	37.1	30.6	26.0	23.8	-
78	221	13	1242	51.1	41.2	33.2	27.6	24.7	-
78	221	13	1347	57.1	45.5	35.2	29.5	25.7	-
78	221	13	1514	55.8	44.2	34.9	30.6	26.8	-
78	221	17	1047	35.7	31.9	27.3	23.6	23.1	-
78	221	17	1144	41.2	36.3	31.3	25.2	24.7	-

* MEASUREMENT BY THERMOMETER
- MISSING OR DELETED DATA

TABLE 24.— Continued.

(e) Field 9, continued

YEAR	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0
78	221	17	1215	44.3	39.7	34.6	26.7	26.6	-
78	221	17	1354	54.5	43.5	38.3	28.3	28.1	-
78	221	17	1517	43.8	43.2	39.1	29.6	30.0	-
78	221	18	1052	38.3	32.6	27.7	25.3	23.7	23.6
78	221	18	1148	44.6	38.4	31.4	27.0	24.6	25.8
78	221	18	1247	45.9	41.3	34.4	29.6	26.3	24.7
78	221	18	1357	55.4	49.2	36.7	31.3	26.9	-
78	221	18	1521	54.9	51.1	37.1	32.4	28.3	26.7
78	221	19	1040	28.3	27.2	27.1	24.7	23.3	-
78	221	19	1136	32.6	31.2	30.9	26.7	24.4	-
78	221	19	1237	35.0	34.2	33.6	28.3	25.5	-
78	221	19	1344	41.9	36.9	36.4	29.7	26.6	-
78	221	19	1511	41.9	38.0	36.1	30.6	27.8	-
78	221	22	1068	40.6	34.5	27.9	-	23.5	23.2
78	221	22	1155	45.5	40.9	30.8	-	24.0	23.2
78	221	22	1255	45.9	42.1	32.7	-	25.0	23.4
78	221	22	1413	53.2	51.1	37.0	-	26.2	23.7
78	221	22	1527	53.4	51.3	44.7	-	27.1	24.5
78	221	23	1055	35.4	36.4	28.7	25.6	23.5	23.4
78	221	23	1152	41.4	41.4	31.8	27.7	24.3	24.0
78	221	23	1252	43.9	42.2	33.4	29.6	25.2	25.1
78	221	23	1409	50.8	48.0	36.1	31.9	26.3	26.1
78	221	23	1524	52.1	48.7	36.7	32.7	37.1	27.0
78	221	24	1114	43.4	-	36.7	35.4	26.2	22.7
78	221	24	1217	45.5	-	36.6	28.6	24.1	22.9
78	221	24	1317	42.1	40.6	37.9	30.3	25.2	23.4
78	221	24	1426	44.8	-	39.7	32.0	26.1	23.8
78	221	27	1102	40.7	34.4	31.4	25.2	23.9	-
78	221	27	1207	47.4	39.3	35.8	27.4	25.1	-
78	221	27	1258	47.8	39.8	36.8	28.3	25.7	-
78	221	27	1416	54.2	45.2	41.3	31.0	27.2	-
78	221	27	1531	49.1	44.7	42.1	32.0	28.4	-
78	221	28	1106	42.1	36.4	26.5	25.1	-	23.1
78	221	28	1212	49.0	41.6	30.0	27.4	-	23.3
78	221	28	1309	50.6	43.2	32.1	29.2	-	23.7
78	221	28	1419	55.2	47.5	34.7	31.5	-	24.4
78	221	28	1535	50.4	44.6	35.7	32.6	-	25.3
78	221	29	1109	36.4	28.8	33.1	26.6	23.5	-
78	221	29	1215	41.3	31.3	33.3	30.0	24.7	-
78	221	29	1314	43.8	32.7	32.9	32.4	25.9	-
78	221	29	1423	47.6	33.9	36.4	34.1	26.6	-
78	223	13	538	-	19.2	21.3	23.2	24.5	-
78	223	13	714	16.2	18.2	20.2	22.3	23.8	-
78	223	13	801	17.3	19.0	20.6	22.1	23.5	-
78	223	13	847	22.4	21.9	21.7	22.1	23.3	-
78	223	17	550	19.7	19.8	21.0	-	-	-
78	223	17	717	18.9	19.1	20.0	22.8	22.8	-
78	223	17	804	19.6	19.7	20.2	22.6	22.5	-
78	223	17	850	21.8	21.8	21.3	22.4	22.3	-
78	223	18	722	17.5	18.4	20.3	22.2	23.5	23.9
78	223	18	607	18.2	18.8	20.6	22.2	23.4	23 9
78	223	18	855	23.6	22.6	22.9	22.4	23.2	23.9
78	223	19	532	19.6	20.8	20.9	23.5	24.5	-
78	223	19	711	18.6	19.8	19.9	22.6	23.6	-
78	223	19	758	19.2	20.0	20.0	22.3	23.4	-
78	223	19	844	21.7	21.1	21.1	22.4	23.1	-
78	223	22	729	18.3	18.6	20.1	-	23.6	24.8
78	223	22	816	19.7	19.9	20.3	22.3	23.3	24.5
78	223	22	903	26.6	25.4	22.7	-	23.3	24.3

* MEASUREMENT BY THERMOMETER
- MISSING OR DELETED DATA

TABLE 24.— Concluded.

(e) Field 9, concluded

YEAR	DAY	LOCATION	TIME (S)	0.5	1.5	3.5	7.0	12.0	22.0
78	223	23	725	18.6	18.7	20.9	22.0	23.8	24.0
78	223	23	814	19.2	19.6	21.1	22.0	23.6	23.7
78	223	23	859	24.9	26.4	23.6	22.5	23.5	23.5
78	223	24	745	18.6	-	19.4	21.4	23.2	23.9
78	223	24	827	21.2	-	22.3	21.3	22.9	22.7
78	223	24	922	26.6	-	27.3	22.3	22.7	23.2
78	223	27	735	17.7	19.2	19.6	22.2	23.8	-
78	223	27	818	19.9	19.8	19.9	22.1	23.5	-
78	223	27	907	26.6	24.3	22.7	22.3	23.4	-
78	223	28	738	17.6	18.7	20.8	21.4	-	24.6
78	223	28	822	22.0	20.1	20.9	21.3	-	24.3
78	223	28	912	30.0	25.4	21.9	21.8	-	24.0
78	223	29	741	18.3	20.1	20.4	21.0	23.6	-
78	223	29	825	19.8	20.5	22.6	21.0	23.3	-
78	223	29	916	26.6	23.6	26.5	21.8	23.1	-

* MEASUREMENT BY THERMOMETER
- MISSING OR DELETED DATA

TABLE 25.— DATA SET II — VEGETATION DATA

Field	Crop (a)	Day 199 (7/18/78)					Day 201 (7/20/78)					Day 202 (7/21/78)				
		H_2O, g/m^3		Plant height, m		Time	H_2O, g/m^3		Plant height, m		Time	H_2O, g/m^3		Plant height, m		Time
		W_1	W_2	H_1	H_2		W_1	W_2	H_1	H_2		W_1	W_2	H_1	H_2	
1	C	3466.8	4507.0	2.08	2.03	1240	3445.8	3053.4	2.44	2.16	1200	3044.2	3065.2	2.36	2.39	930
2	C						2047.3	2282.9	2.34	2.16	1005	1822.3	2344.2	2.44	2.29	1040
3	C	2059.5	2058.6	1.22	1.37	1640	2056.3	1882.9	1.42	1.65	1225	1788.2	2268.4	1.91	1.65	1155
[b]5	P		21.458		.0381	1715	9.144	81.93	.0508	.0127	1305	22.92	32.19	.0762	.0762	1255
[c]8	P						9.720	26.33	.108	.0254	1330	33.65	69.68	.0508	.0508	1335
[c]14	P	8.964	8.120	.114	.127	1750	11.92	8.961	.127	.0508	1320	26.21		.0762		1320
19	C	1921.5	2304.7	1.68	2.03	1355	1952.8	1750.3	2.18	2.24	1120	1761.7	2268.7	1.93	2.13	1000
20	C	2079.1		1.83		1410	2085.0	1854.6	2.11	1.80	1110	2199.9	2166.1	2.13	1.91	1015
21	C	2471.2	2474.6	2.24	2.13	1420	2298.0	2142.7	2.39	1.98	1100	2113.6	2551.8	2.39	2.39	1025
22	C	2158.7	2442.8	2.08	2.03	1440	2375.1	2116.8	2.08	2.03	1040	2339.1		2.31		1035
24	M		2128.1		1.52	1545	1698.6	1784.4	1.83	1.78	950	1891.3	2207.0	1.93	1.98	1100
26	C	2085.2	1952.7	1.52	1.57	1600	2346.3	1793.8	1.63	1.83	940	1518.1		1.93		1110
28	C	3111.7	2335.3	2.18	2.29	1625	2763.9	2975.8	1.98	2.21	925	2314.5	2269.4	1.91	1.78	1120
37	C	2497.9	1627.6	1.52	1.07	1700	2175.0	1738.9	1.42	1.55	1250	1516.4	2233.5	1.47	1.30	1240
39	M	2058.6	2673.6	.660	.737	1830	3592.7	2531.9	.660	.762	1400	2394.2	4404.8	.914	.711	1405
40	C	1550.0	2075.0	1.83	1.78	1820	1876.6	1692.4	1.93	2.21	1350					

[a]C = corn, M = milo, and P = pasture.

[b]Plant samples consisted of three plants in each row, unless indicated otherwise.

[c]Plant samples consisted of vegetation over a 1-ft^2 area.

TABLE 25.— Concluded.

Field	Crop (a)	Day 203 (7/22/78)					Day 222 (8/10/78)				
		H_2O, g/m^3		Plant height, m		Time	H_2O, g/m^3		Plant height, m		Time
		W_1	W_2	H_1	H_2		W_1	W_2	H_1	H_2	
1	C	3339.8	3188.5	2.49	2.54	900					
2	C	2136.6	2202.8	2.49	2.46	950	572.6	575.9	2.21	2.18	1230
3	C	1795.6	2386.7	1.83	1.68	1035	375.6	489.1	1.85	1.91	1215
[b]5	P	16.76	14.39	.102	.0762	1055					
[c]8	P	20.73	94.05	.0762	.00889	1130					
[c]14	P	7.497	85.30	.114	.0762	1115					
19	C										
20	C	1924.4	1988.2	2.06	2.18	925					
21	C	2358.6	2108.7	1.80	2.39	935					
22	C										
24	M	1989.6	1934.3	1.83	1.98	1005					
26	C	2093.7	1997.4	1.98	1.98	1015	582.1	603.6	2.13	1.91	1315
28	C										
37	C						500.9		1.91		1125
39	M	2256.0	3089.0	.660	.762	1150	759.0	1804.3	1.04	.914	1130
40	C						571.1	754.4	2.24	1.88	1240

[a]C = corn, M = milo, and P = pasture.

[b]Plant samples consisted of three plants in each row, unless indicated otherwise.

[c]Plant samples consisted of vegetation over a 1-ft^2 area.

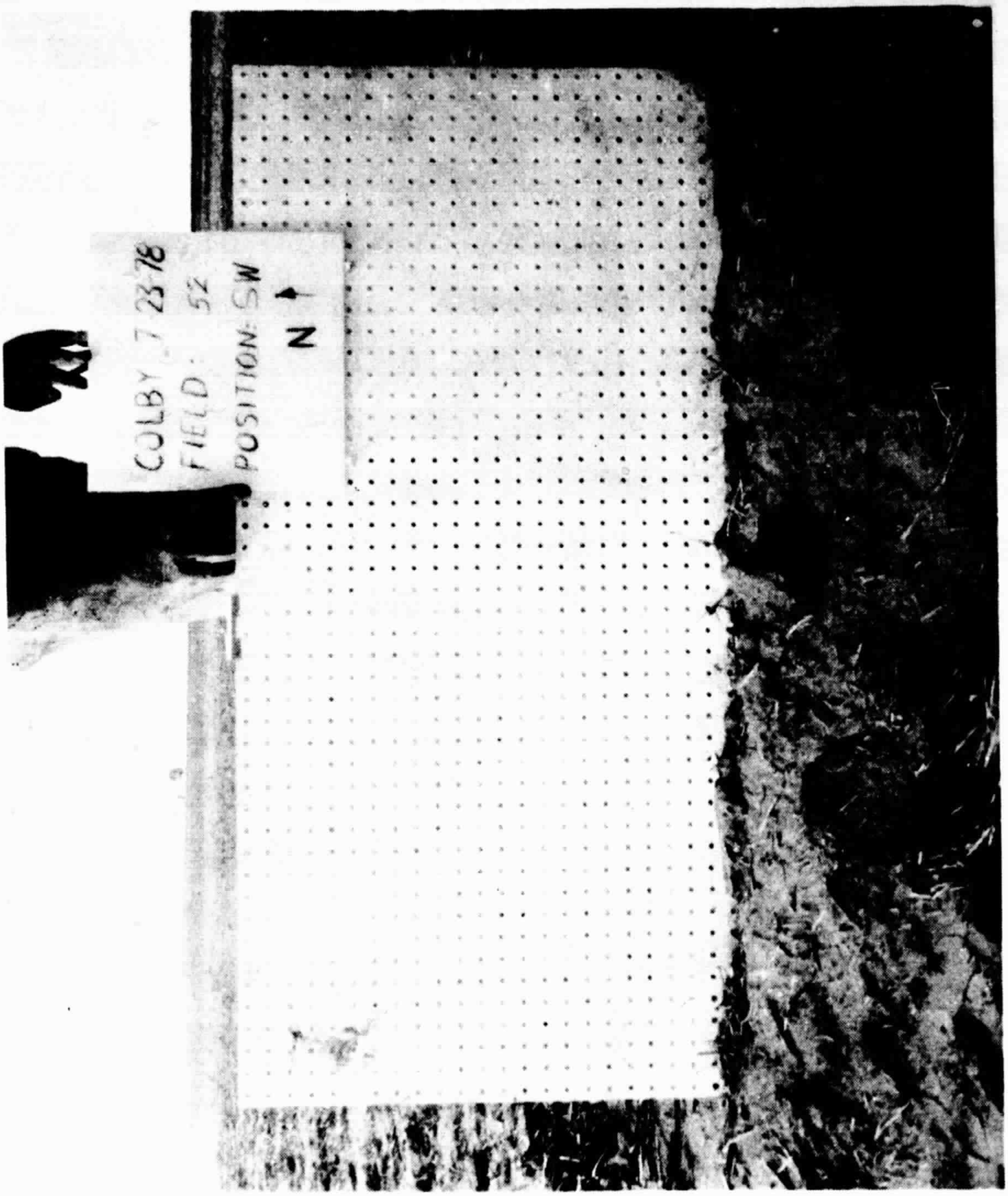

Figure 7.– Surface roughness photograph.

5. REFERENCES

1. Richard, L. A.: Methods of Soil Analysis. Am. Soc. Agronomy, 1965, pp. 131-137.

2. Klute, Arnold: Methods of Soil Analysis. Am. Soc. Agronomy, 1965, pp. 210-215.

APPENDIX A

ADDITIONAL COLBY DATA AVAILABLE

APPENDIX A

ADDITIONAL COLBY DATA AVAILABLE

In addition to the data listed in the body of this report, the following information on the Colby area will be available in the near future.

1. Photomosaic – The seven flight lines were flown at 2438 meters (8000 feet) on June 18, 1978, by the C-130 aircraft. Photographs were acquired for construction of a semicontrolled photomosaic for locating aircraft sensor data on the ground to ±15 meters (±50 feet).

   Available date: September 1979

   Source: See note 1

2. Photograph overlays – Overlays defining principal point of each photograph are available for days 199 and 201. These are keyed to line and run.

   Available date: September 1979

   Source: See note 1

3. Thomas County soils map – A soils map is being constructed by the U.S. Department of Agriculture Soil Conservation Service in Colby. This map shows soil type and slope for individual fields.

   Available date: January 1980

   Source: Soil Conservation Service
Box 525
750 South Range
Colby, KS 67701

APPENDIX B

EQUIPMENT LIST

APPENDIX B

EQUIPMENT LIST

The following equipment was used in support of 1978 ASME data collection at Colby, Kansas.

Item	Vendor	Model no.	Serial no.
Thermistor thermometer	Omega Engineering	46	875011-45577
Thermocouple voltage measuring instrument	Wescor	TH65	8177134
Thermocouple voltage measuring instrument	Wescor	TH65	8177133
Thermocouple voltage measuring instrument	Wescor	TH50	1244
Reference standard/ infrared field thermometer	Barnes Engineering Company	102315	
Scientific grieve mechanical oven	Fischer	13-261-32	992
Scientific grieve mechanical oven	Fischer	13-261-32	1013
Analytical balance	Mettler Instrument Corp.	E200	590986
Analytical balance top loading	Mettler Instrument Corp.	E200/344	590987
Scientific oven (forced air) 220 volts	Napco	630-7	2-73-1163-22
Portable meter area readout	Lambda Electronics	LI3000	PAM 156741
Conveyor belt accessories	Lambda Electronics	LI3050A	TBA 129-7501
15-bar ceramic plate extractor		Cat. #1500	
Pressure control manifolds		Cat. #700-2	
Soil core sampler (for bulk density samples)		Cat. #200	
Scientific thermometers (27)	Scientific		
Thermometer		Cal. #C14983	

APPENDIX C

ASME TEST FIELD OPERATORS

APPENDIX C

ASME TEST FIELD OPERATORS

The following is a list of ASME test field operators for Thomas County in 1978.

Operator	Address	Field no.
Ralph Albers	Oakley, Kansas	49
James Bartlett	Colby, Kansas	11
Clem Bremenkamp	Colby, Kansas	14
Cornstock Farms, Inc. Ed Goossen	Colby, Kansas	25, 27
William Engelhardt	Colby, Kansas	7, 31, 56
Glendora Grover	Oakley, Kansas	8
John G. Hansen	Colby, Kansas	21, 22
Harold Herbel	Colby, Kansas	1, 55
Frank Howard	Oakley, Kansas	5
Les Keller	Oakley, Kansas	3, 34
Verlan Olson	Russell, Kansas	4
H. A. Regier	Colby, Kansas	29, 30
Dennis P. Ryan	Colby, Kansas	12
Cyril H. Saddler	Colby, Kansas	9, 45, 46
Charles W. Schroeder	Colby, Kansas	52
Henry Siebert	Colby, Kansas	19, 20
Wight Sims	Oakley, Kansas	50
Ivan Steinle	Colby, Kansas	2, 6, 13, 24, 26, 28, 43, 54
Stephens Farms, Inc. Mrs. Carl Stephens	Menlo, Kansas	47
Joseph Stevens	Colby, Kansas	10, 44
Frank Vacin	Colby, Kansas	53
George Wiens	Monument, Kansas	16
Clarence F. Wilson	Colby, Kansas	37, 38
Robert E. Zelfer	Colby, Kansas	39, 40

APPENDIX D

ON THE DESIGN OF AN EXPERIMENT TO MEASURE SOIL MOISTURE USING MICROWAVE DATA

By R. S. Chhikara and N. E. Marquina

1. INTRODUCTION

An application of microwave sensing that has stimulated the interest of soil scientists in the last few years is the remote measurement of soil moisture. This application is felt to be viable because laboratory measurements have demonstrated that the microwave permittivity of soil is highly dependent on soil moisture. However, other factors such as nonhomogeneities in the soil, the geometry of the surface boundary, and vegetation above the soil interact with the electromagnetic energy and affect the microwave response of the soil (ref. 1).

Techniques have been developed for extracting soil moisture information from data acquired with microwave sensors. A significant correlation exists between the radar back scattering coefficient σ^0 and the soil moisture in the top layer of soil as shown in reference 2. However, to demonstrate the capability of estimating soil moisture remotely, more experimental work is required. Data collection and analyses should be based on a well-designed experiment, in which consideration is given to the full range of physical conditions influencing the soil moisture and the different microwave sensing factors that would influence σ^0.

During July and August 1978, an extensive data set was gathered at a site near Colby, Kansas, to support the development of algorithms to estimate surface soil moisture from σ^0 and other remotely sensed parameters.

The study described here was carried out to aid in the determination of how many fields per crop type needed to be sampled at Colby. It includes the effect of physical factors affecting soil moisture such as soil, slope, and vegetation type and factors affecting the microwave sensors such as frequency, angle of incidence, and polarization.

2. STATISTICAL ANALYSIS

2.1 DATA ANALYSIS APPROACH

The regression analysis approach may be used to study the dependence between σ^0 and the soil moisture, X. However, when data for σ^0 are obtained using different frequencies, polarizations, and angles of incidence, a more suitable approach is to analyze the data by performing an analysis of covariance, a technique that combines the features of analysis of variance and regression (ref. 3). The analysis-of-variance part of the analysis of covariance is primarily to investigate the error sources resulting from different configurations in operating the microwave sensors.

The following model* relating σ^0 to the soil moisture X is assumed:

$$\sigma^0_{ijkl} = \mu + \alpha_i + \delta_j + \gamma_k + \beta(X_{ijkl} - \bar{X}) + \varepsilon_{ijkl} \tag{1}$$

where μ represents the overall mean for σ^0, α_i is the effect of the *ith* polarization, δ_j is the effect of the *jth* frequency, γ_k is the effect of the *kth* angle of incidence, β is the regression coefficient of σ^0 on X, and the ε_{ijkl} are the residuals.

The choice of levels for the three factors (frequency, polarization, and angle of incidence) depends upon the availability of data for σ^0. The following levels are considered in the present study:

- Frequency: 4.25 gigahertz, 5.25 gigahertz
- Polarization: horizontal, vertical
- Angle of incidence: 0, 10

The soil moisture is considered for the top 5-centimeter layer of the soil. The data analysis using model (1) is considered for both vegetative and

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*For estimating soil moisture from σ^0, it is more appropriate to regress X on σ^0. However, not enough observations of X are available to permit an analysis of covariance if this change is made in the model.

nonvegetative (bare soil) conditions. Only wheat and corn fields are included for vegetation. This limitation was purely due to the availability of data described in section 2.2. A separate analysis is made for each crop.

The basic objective of the data analysis using the suggested approach is (1) to determine whether the dependence of σ^0 on soil moisture is significant, (2) to determine whether each of the factors (frequency, angle, and polarization) has a significant effect on σ^0, and (3) to estimate the error variance (i.e., inherent variability) of σ^0 by removing the variability in σ^0 caused by soil moisture and the three factors. An unbiased and reliable estimate of the error variance is needed to estimate the number of fields to achieve an efficient sampling design. The estimation of the required number of fields is discussed in section 3.

2.2 DATA USED IN THE ANALYSIS

The data considered in the present analysis are given in the appendix and correspond to different experimental conditions. These data sets are described in detail in references 4 and 5. The data consist of soil moisture in the top 5 centimeters of the soil and σ^0. They include (1) data on five bare soil fields near Garden City, Kansas, collected between September 12 and October 13, 1975 (ref. 4); (2) data on four corn fields near Lawrence, Kansas, collected between May 21 and August 22, 1975 (ref. 5); and (3) data on seven wheat fields near Lawrence, Kansas, collected between May 20 and July 9, 1975 (ref. 5). One observation per field was chosen for the analysis. The criterion for choosing the observations was the time factor. An attempt was made to select the observations to be as close as possible in time of day and time of year. Most of the selected observations were made between 10:00 a.m. and 12:00 noon, but they varied widely with respect to time of year. Thus, the data available did not allow complete removal of the time factor from the analysis.

For each soil moisture observation, there are 2×2×2 = 8 observations for σ^0 corresponding to two frequencies (4.25 and 5.25 gigahertz), two polarizations (horizontal and vertical), and two angles of incidence (0° and 10°). The soil moisture in the top layer of 5 centimeters is obtained by taking the weighted

average of those in the 0- to 1-, 1- to 2-, and 2- and 5-centimeter depth layers. The width of a depth layer is used as weight.

2.3 RESULTS

2.3.1 ANALYSIS OF THE COMPLETE DATA SET

Tables 1, 2, and 3 give the results of the analysis of covariance performed on bare soil, wheat, and corn data, respectively. Each table shows the sources of variation in σ^0, their mean square errors, the value of the Fisher statistic F, and the computed significance levels. Also given is the residual mean square error, which is an estimate of the error variance. The significance level measures the likelihood of committing error in rejecting the hypothesis of no effect on σ^0 due to a source of variation. The variation due to soil moisture indicates the degree to which σ^0 depends upon the soil moisture in the top 5-centimeter layer.

The following inferences are made from these results by testing the hypothesis of no effect at the 5-percent level of significance:

1. There is a highly significant dependence of σ^0 on soil moisture in the 0- to 5-centimeter depth layer for bare soil, wheat, and corn; it is the highest for bare soil.
2. The angle of incidence has a significant effect on σ^0 for bare soil, wheat, and corn.
3. The error variance estimates are 24.54, 35.25, and 16.89 for bare soil, wheat, and corn, respectively. A high error estimate for wheat seems partly due to the time factor since wheat data were collected over a period of 2 months.

2.3.2 ANALYSIS OF INDIVIDUAL DATA SETS

The relationship of σ^0 to soil moisture was studied separately for each configuration of instruments (i.e., a specified level for each frequency, polarization, and angle of incidence) and crop type. A set of regression analyses of different data sets was made using the simple linear regression model,

TABLE 1.— ANALYSIS OF COVARIANCE PERFORMED ON BARE SOIL DATA

Source of variation	Degrees of freedom	Sum of squares	Mean square error	F	Significance of F
Soil moisture	1	1601.21	1601.21	65.2	0.000
Polarization	1	.05	.05	.0	.965
Frequency	1	4.62	4.62	.19	.667
Angle	1	310.24	310.24	12.64	.001
Error	35	858.85	24.54		
Total	39	2774.97	71.15		

TABLE 2.— ANALYSIS OF COVARIANCE PERFORMED ON WHEAT DATA

Source of variation	Degrees of freedom	Sum of squares	Mean square error	F	Significance of F
Soil moisture	1	545.00	545.00	15.46	0.000
Polarization	1	2.08	2.08	.06	.809
Frequency	1	2.75	2.75	.08	.781
Angle	1	383.78	383.78	10.89	.002
Error	51	1797.97	35.25		
Total	55	2731.58	49.66		

TABLE 3.– ANALYSIS OF COVARIANCE PERFORMED ON CORN DATA

Source of variation	Degrees of freedom	Sum of squares	Mean square error	F	Significance of F
Soil moisture	1	200.70	200.70	21.78	0.000
Polarization	1	1.80	1.80	.20	.662
Frequency	1	4.96	4.96	.54	.469
Angle	1	67.28	67.28	7.30	.012
Error	27	248.76	9.21		
Total	31	523.50	16.89		

$$\sigma^0 = \beta_0 + \beta_1 X + \varepsilon, \tag{2}$$

where β_0 and β_1 are the regression coefficients and ε, the random error for σ^0, is assumed to be independent of X.

Let $\hat{\sigma}^0 = b_0 + b_1 X$ be the regression equation obtained from the least-square fit of data to the above model. Suppose that s^2 is the residual mean square error given by

$$s^2 = \frac{1}{n - 2} \sum_{i=1}^{n} \left(\sigma_i^0 - \hat{\sigma}_i^0\right)^2$$

where n is the number of data points used in obtaining a regression equation and σ_i^0 and $\hat{\sigma}_i^0$ are, respectively, the observed and the predicted back scattering coefficients for field i. A smaller s^2 would indicate that the soil moisture is a good predictor of σ^0 or vice versa.

Table 4 presents the results of these regression analyses. The table contains the values of b_0, b_1, r (the correlation coefficient between σ^0 and soil moisture), and s^2. In addition to the two levels (0° and 10°) of the angle of incidence considered in section 2.3.1, the 5° angle is included for bare soil only. The $\sigma°$ data corresponding to the 5° angle of incidence were not available for wheat or corn.

These results indicate a significant correlation between σ^0 and soil moisture. An exception occurred in the case of wheat using 4.25-gigahertz frequency and the 10° angle. The results for bare soil are more consistent and illuminating when compared to the other two cases. The value s^2 decreases significantly when going from 0° to either 5° or 10°, but there is no significant difference between the results at 5° and at 10°. Increasing the frequency from 4.25 to 5.25 gigahertz does not increase or reduce s^2 significantly. The instrument configuration of vertical polarization, 5.25-gigahertz frequency, and 5° angle gives the highest correlation coefficient and the smallest value for s^2.

TABLE 4.– REGRESSION ANALYSES OF BACK SCATTERING COEFFICIENT DATA

Angle of incidence, °	Regression coefficients and parametric values	Horizontal polarization		Vertical polarization	
		Frequency, 4.25 GHz	Frequency, 5.25 GHz	Frequency, 4.25 GHz	Frequency, 5.25 GHz
Bare soil					
0	b_0	-46.5	-44.09	-45.73	-45.07
	b_1	166.86	154.59	165.94	158.25
	r	.84	.85	.83	.86
	s^2	31.152	24.801	34.617	24.480
5	b_0	-30.68	-31.62	-34.78	-34.15
	b_1	84.9	86.46	100.31	96.70
	r	.89	.91	.94	.94
	s^2	4.914	4.230	3.652	3.241
10	b_0	-30.36	-30.49	-31.39	-31.52
	b_1	79.78	77.08	82.12	83.78
	r	.86	.85	.92	.98
	s^2	5.962	6.355	3.195	4.583
Wheat					
0	b_0	-1.14	-3.84	-3.02	-4.50
	b_1	27.84	37.25	35.38	40.1
	r	.48	.59	.56	.60
	s^2	45.720	46.003	46.345	50.240
10	b_0	-0.028	-4.30	-1.00	-5.16
	b_1	1.25	16.51	8.56	22.55
	r	.06	.54	.32	.63
	s^2	8.232	11.203	11.403	13.256
Corn					
0	b_0	-11.09	-11.22	-11.09	-11.48
	b_1	72.56	78.52	72.38	82.30
	r	.76	.74	.76	.76
	s^2	8.882	11.813	9.074	11.428
10	b_0	-8.28	-9.67	-6.18	-8.64
	b_1	18.08	43.27	14.60	35.16
	r	.60	.85	.75	.63
	s^2	1.332	1.616	.392	4.267

Unfortunately, no meaningful inferences can be made from the results for wheat and corn. First of all, no data are available for the 5° angle. Next, since the data for wheat and corn varied widely with respect to time of year, the observations cover different growth stages.

Because the plant moisture changes with the growing season, changes in σ^0 due to plant water content rather than to soil moisture are expected. Ideally, in order to consider the time factor, data should be collected at a given time of the year and at a given time interval during the day for all fields. This should be repeated several times a year.

If there was indeed a significant effect due to any other factor, it was not detected by the analysis because of the small sample size (only five data points for bare soil, seven for wheat, and four for corn). In fact, the reliability of all results discussed here is low because not enough data points were available for error analysis.

In conclusion, the results for bare soil depict a well-defined pattern that is in line with the theory behind radar response to vegetation (refs. 1, 2, and 6). No such conclusion can be made for wheat and corn because of variations in the data with respect to crop growth stage. Ideally, the measurements should be made when the crops are at the same growth stage or time of year. It is imperative that the plant's water content be treated as a covariable affecting σ^0. Data collected at the same time of year should provide the information needed to design a statistically valid experiment for soil moisture estimation.

3. SAMPLING REQUIREMENTS FOR CORN, WHEAT, AND BARE SOIL FIELDS FROM THE COLBY SITE

A statistically valid determination of the number of fields to be sampled at Colby would require estimates of the variability of soil moisture and σ^0 at that site. Since the data discussed above are from different sites, they can only provide a guideline for the sampling requirements.

Assuming the data given above can be applied at the Colby site, the Neyman sample allocation technique given in reference 7 was employed to determine the total number of sample fields and their distribution between crop types. This technique gives an optimum sample allocation for a stratified random sampling scheme provided that the inputs for strata variances and strata sizes are correct. In this case, it was designed to achieve a coefficient of variation of 5 percent for the sampling error. The total number of fields n needed to be sampled is given by

$$n = \frac{\left(\sum_{i=1}^{3} N_i S_i\right)^2}{N^2 \sigma^2 + \sum_{i=1}^{3} N_i S_i^2} \tag{3}$$

where

N_i = number of fields of the *ith* crop type,

S_i^2 = error variance of σ^0 values for the *ith* crop type,

σ^2 = specified precision (variance),

$N = \sum_{i=1}^{3} N_i$,

and

$i = 1, 2, 3.$

Precision is generally specified in terms of the coefficient of variation V. If μ is the mean parameter, then the specified precision can be expressed as $\mu^2 V^2 = \sigma^2$.

The distribution of n between the crop types is given by

$$n_i = \frac{N_i S_i}{\sum_{i=1}^{3} N_i S_i} \times n, \; i = 1, 2, 3.$$

For methodological details of the procedure, see reference 6.

Using the results given in table 5 for inputs in equation (3), an estimate of μ equal to -17.4 obtained from the data in the appendix, and a coefficient of variation of 5 percent (designed to achieve at least a 90-percent confidence in the estimate of σ^0), the number of sample fields is as follows:

Crop type	No. of fields
Bare soil	13
Wheat	15
Corn	4
Total	32

TABLE 5.— COLBY SITE DATA USED IN THE DESIGN OF EXPERIMENT

Crop type (i)	No. of fields (N_i)	Between-field variance (s_i^2)
1. Bare soil	480	24.54
2. Wheat	480	35.25
3. Corn	240	16.89

5. REFERENCES

1. Newton, Richard Wayne: Microwave Remote Sensing and Its Applications to Soil Moisture Detection. Tech. rpt. RCS-81, Texas A&M University, 1977.

2. Cihlar, Josef; and Ulaby, Fawwaz, T.: Dielectric Properties of Soil as a Function of Moisture Content. Univ. of Kans. Remote Sensing Laboratory, Tech. rpt. 177-47, 1974.

3. Snedecor, George W.; and Cochran, William G.: Statistical Methods. Sixth ed., The Iowa State University Press, 1967.

4. Batlivala, P. P.; and Dobson, C.: Soil Moisture Experiment (Kansas) Documentation of Radar Backscatter and Ground Truth Data. Univ. of Kans. Remote Sensing Laboratory, Tech. rpt. 264-7, Mar. 1976.

5. Dobson, C.; et al.: Data Documentation: 1975 MAS 1-8 amd MAS 8-18 Vegetation Experiments. Univ. of Kans. Remote Sensing Laboratory, Tech. rpt. 264-15, 1977.

6. Ulaby, F. T.: Radar Response to Vegetation. IEEE Trans. Antennas and Propagation, vol. AP-23, no. 1, 1975, pp. 36-45.

7. Cochran, William G.: Sampling Techniques. Third ed., John Wiley and Sons, New York, 1977.

APPENDIX

BARE SOIL, WHEAT, AND CORN DATA

Back scattering coefficient data and soil moisture ground truth for bare soil, wheat, and corn are given in tables A-1 through A-3, respectively.

TABLE A-1.— BARE SOIL DATA

(a) Radar back scattering coefficients

[Ref. 4]

Observation	Frequency, GHz	Horizontal polarization		Vertical polarization	
		Angle of incidence, 0°	Angle of incidence, 10°	Angle of incidence, 0°	Angle of incidence, 10°
1	4.25	-6.5	-6.8	-6.1	-8.1
	5.25	-6.5	-7.9	-6.5	-5.4
2	4.25	-7.8	-6.6	-9.3	-8.1
	5.25	-9.7	-7.0	-9.5	-8.0
3	4.25	-11.3	-15.0	-11.3	-15.4
	5.25	-12.0	-17.0	-12.0	-16.5
4	4.25	-14.5	-18.0	-13.1	-18.0
	5.25	-14.1	-17.6	-14.8	-17.0
5	4.25	14.9	-7.1	15.6	-6.2
	5.25	12.3	-8.0	12.4	-7.5

TABLE A-1.– Concluded.

(b) Soil moisture ground truth

Field no.	Depth, cm			Combined depth, 0 to 5 cm
	0 to 1	1 to 2	2 to 5	
1	0.32	0.30	0.28	0.292
2	.26	.26	.23	.242
3	.18	.20	.20	.196
4	.08	.18	.22	.184
5	.34	.32	.31	.318

TABLE A-2.— WHEAT DATA

(a) Radar back scattering coefficients

[Ref. 5]

Field no.	Frequency, GHz	Horizontal polarization		Vertical polarization	
		Angle of incidence, 0°	Angle of incidence, 10°	Angle of incidence, 0°	Angle of incidence, 10°
1	4.25	1.5	2.0	-6.4	-3.6
	5.25	-4.2	-2.9	-7.8	-4.9
2	4.25	-5.9	-4.8	-3.0	-3.0
	5.25	-4.2	-5.9	-2.7	-4.6
3	4.25	16.3	2.0	17.0	3.0
	5.25	17.6	4.8	17.8	5.8
4	4.25	13.8	3.6	14.5	7.0
	5.25	14.4	5.8	14.6	8.1
5	4.25	-2.0	-2.8	0.9	-0.1
	5.25	-1.9	-2.7	-1.0	-2.6
6	4.25	10.6	-0.2	10.5	0.5
	5.25	10.0	1.4	10.0	2.2
7	4.25	6.6	2.6	7.5	4.2
	5.25	6.8	-1.6	8.1	-0.5

TABLE A-2.– Concluded.

(b) Soil moisture ground truth

Field no.	Depth, cm			Combined depth, 0 to 5 cm
	0 to 1	1 to 2	2 to 5	
1	0.087	0.104	0.142	0.123
2	.423	.300	.361	.361
3	.396	.343	.434	.408
4	.425	.335	.399	.391
5	.034	.053	.105	.080
6	.154	.275	.319	.277
7	.079	.089	.134	.114

TABLE A-3.— CORN DATA

(a) Radar back scattering coefficients

[Ref. 5]

Field no.	Frequency, GHz	Horizontal polarization		Vertical polarization	
		Angle of incidence, 0°	Angle of incidence, 10°	Angle of incidence, 0°	Angle of incidence, 10°
1	4.25	-6.9	-8.4	-6.9	-4.9
	5.25	-6.4	-7.0	-6.4	-5.5
2	4.25	-2.4	-5.4	-2.4	-4.7
	5.25	-1.8	-5.0	-1.8	-4.7
3	4.25	-4.9	-6.0	-5.0	-5.2
	5.25	-5.1	-5.2	-4.7	-7.2
4	4.25	5.2	-4.5	5.2	-2.8
	5.25	6.7	-0.4	7.1	0.0

TABLE A-3.— Concluded.

(b) Soil moisture ground truth

Field no.	Depth, cm			Combined depth, 0 to 5 cm
	0 to 1	1 to 2	2 to 5	
1	0.061	0.064	0.099	0.084
2	.063	.060	.079	.072
3	.092	.094	.168	.138
4	.085	.200	.227	.193

APPENDIX E

SUMMARY OF NASA AIRCRAFT (NC-130) DATA COLLECTED FOR THE AGRICULTURAL SOIL MOISTURE EXPERIMENT (ASME) DURING 1978

By F. R. Brumbaugh

1. INTRODUCTION

During the period from July 18 to August 9, 1978, the NC-130 aircraft of the National Aeronautics and Space Administration (NASA) conducted a total of seven data-gathering flights over a test site near Colby, Kansas, as part of a project to develop algorithms for determining soil moisture from remotely sensed data.[1] At or near the time of overpass, field teams collected extensive ground-truth data for selected fields under the NC-130 flightpath. For some of these fields, active and passive microwave data were obtained from sensors or trucks.

This document catalogs the details of the data collected by the sensors in the aircraft, including times and tape numbers. The ground truth and truck data will be described elsewhere.

2. THE NC-130 DATA COLLECTION FLIGHTS

Figure 1 shows the test site, the fields where ground truth was taken, and the seven NC-130 flight lines. The flight lines were always flown in the same direction as shown by the arrows. The appendix gives the sensor configuration on the aircraft.

Table 1 summarizes the seven flights. It gives the dates, times, and altitudes flown, along with some details of the type of data obtained from each sensor. Each altitude flown consists of one or more sequences; each sequence consisting of a certain number of flight lines in a certain order. Three sequences were used; they consisted of the following flight lines:

Sequence	Flight lines
1	4, 3, 7, 1, 5, 6, 2
2	4, 3, 7, 1, 5
3	3, 7, 1, 5, 6, 2

[1] Described in Project Support Plan OA-0387, JSC-10562.

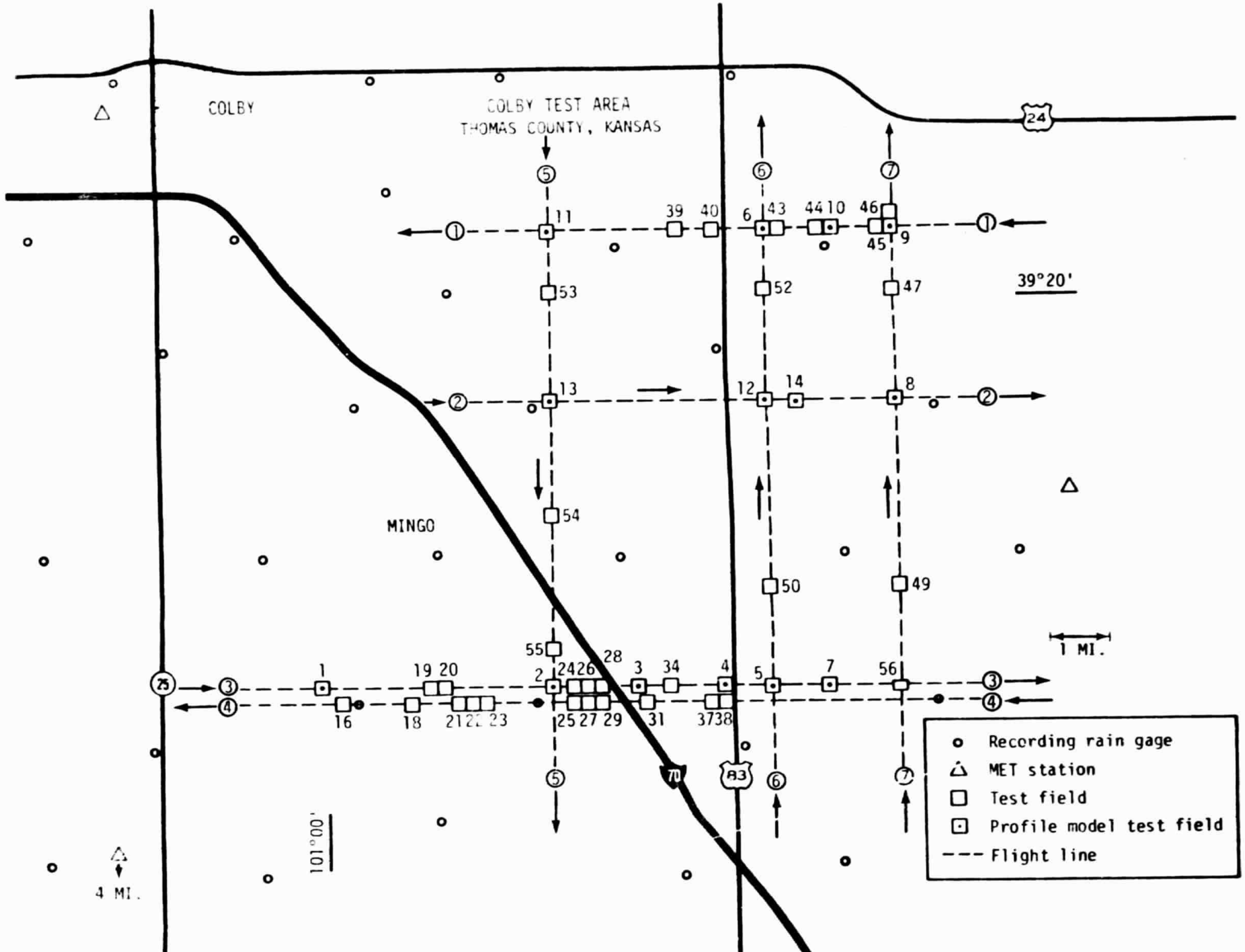

Figure 1.— NC-130 aircraft flight lines and test field locations for the Colby, Kansas, test site.

TABLE 1.— ASME NC-130 AIRCRAFT SENSOR DATA COLLECTION SUMMARY SHEET — 1978

Flt. no.		Date	Site (e)	Camera data			PRT-5 (a)	MMS (a)	PMIS (10.69 GHz) (a)	Passive radiometers (MFMR)			Active scatterometers				A/C avg. alt. (ft)
Data	A/C			Zeiss	AMPS	HASS				K-band (e)	C-band (5.0 GHz)	L-band (1.42 GHz)	P-band (0.4 GHz)	L-band (1.6 GHz)	C-band (4.76 GHz)	K-band (13.3 GHz) (a)	
4	6	7-16 (199)	Colby	CIR[b]	-	-	x	x	x	-	-	-	-	-	-	-	8000
				CIR	B/W[c] and B/WIR[d]	-	x	x	x	0° & 40°	0° & 40°	0° & 40° H & V	H & V	H & V	H & V	x	1500 1000
5	7	7-20 (201)	Colby	CIR	--	-	x	x	x	-	-	-	-	-	-	-	8000
				CIR	B/W and B/WIR	-	x	x	x	0° & 40°	0° & 40°	0° & 40° H & V	H & V	H & V	H & V	x	1500 1000
6	8	7-21 (202)	Colby	CIR	B/W and B/WIR	-	x	x	x	-	-	-	-	-	-	-	8000
				Color	B/W and B/WIR	-	x	x	x	0° & 40°	0° & 40°	0° & 40° H & V	H & V	H & V	H & V	x	1500 1000
12	8	7-21 (202)	Yuma, Colo.	CIR	B/W and B/WIR	-	x	x	-	-	-	-	-	-	-	-	400
7	9	7-22 (203)	Colby	Color and B/W	B/W and B/WIR	-	x	x	x	1500 0° & 40°	0° & 40°	0° & 40° H & V	H & V	H & V	H & V	x	1500 1000
8	25	8-8 (220)	Colby	CIR	B/W and B/WIR	CIR	x	x	x	-	-	-	-	-	-	-	8000
				CIR and B/W	B/W and B/WIR	CIR	x	x	x	0° & 40°	0° & 40°	0° & 40° H & V	H & V	H & V	H & V	x	1500 1000
9	26	8-9 (221)	Colby	CIR	B/W and B/WIR	-	x	x	x	-	-	-	-	-	-	-	7000
				B/W and CIR	B/W and B/WIR	CIR	x	x	x	0° & 40°	0° & 40°	0° & 40° H & V	H & V	H & V	H & V	x	1500 1000
13	26	8-9 (221)	Yuma, Colo.	CIR	B/W and B/WIR	-	x	x	x	-	-	-	-	-	-	-	450
10	28	[f]8-11 (223)	Colby	B/W	-	-	x	x	x	0° & 40°	0° & 40°	0° & 40° H & V	H & V	H & V	H & V	x	1500 1000

[a] x indicates "sensor on."
[b] CIR = Color infrared film.
[c] B/W = Black-and-white negative film.
[d] B/WIR = black and white infrared film.
[e] K refers to K, Ka, and Ku. K is 22.05 GHz, Ka is 37.0 GHz, and Ku is 18.0 GHz.
[f] Pre-dawn flight.

During this mission, some data were taken for another project at a site near Yuma, Colorado. Since the data are included with the Colby data, they are identified in the tables in this report.

Table 2 gives the data acquired by flight line and sequence. A line separates different sequences. The meaning of the column headings is as follows.

Alt. = The assigned altitude.

A/P = Active or passive sequence

L = Flight line number (see fig. 1)

R = Run number to identify a particular run over a flight line. Run numbers were assigned in the original plan, and R referred to the R*th* run that day over the line. However, because the actual flights sometimes were not in the planned order, the R's are not always in consecutive order.

GMT = Greenwich mean time in hours, minutes, and seconds for the start of the flight line.

A, B, C, D = Tape recorder designation. The numbers are the last three digits of the tape number. The prefix is L05-0-005.

GS = Ground speed (in knots) minus 100 knots.

DR = Drift of aircraft (in degrees), left or right.

TH = True heading (in degrees).

RA = Radar altimeter reading in thousands of feet.

KR, CR, LR = K-band, C-band, and L-band radiometer look angles and polarizations. The K-band is actually three bands – K, Ka, and Ku. The numbers are look angles in degrees. H indicates horizontal polarization; V, vertical polarization.

PS, LS, CS, KS = P-band, L-band, C-band, and K-band scatterometers. H and V refer to horizontal and vertical polarization. X indicates "sensor on."

PMIS = Passive Microwave Imaging System. X indicates "sensor on."

PRT = PRT-5 passive radiometer; M = mid-range; H = high range.

MMS = Modular multispectral scanner. The numbers indicate the scan rate.

TABLE 2.– DATA ACQUIRED BY FLIGHT LINE AND SEQUENCE

(a) Data flight 4 – July 18 (Julian day 199).

Alt.	A/C	L	R	GMT	Tape recorder A	B	C	D	GS	DR	TH	HA	KR	CD	LR	PS	LS	CS	KS	PMIS	PRT	MMS	Z	AMPS	H	KZ
8	A	3	6	17:00:45	348			349	92	2,2 L	99	[illegible]								X	M	16	X			
8	A	2	6	17:0[illegible]:25	[illegible]			349	77	5,7 R	[illegible]	0,20								X	M	15	X			
8	A	1	6	17:16:20	348			349	60	0,1 L	26[illegible]	0,19								X	M	14	X			
8	A	5	6	17:23:30	348			349	[illegible]	2,3 L	[illegible]	0,15								X	M	15	X			
8	A	6	1	17:29:20	348			349	78	4,2 R	354	0,17								X	M	15	X			
8	A	2	1	17:3[illegible]:20	348			349	61	0,6 L	89	0,19								X	M	16	X			
1.5	A	4	1	17:57:20	348	350	351	349	64	6,0 L	27[illegible]	1,33		0		H	H	H	X		M	72	X	X		
1.5	A	3	1	18:04:20	348	350	351	349	61	6,5 R	[illegible]	[illegible]		0		H	H	H	X		M	72	X	X		
1.5	A	2	1	18:15:45	348	350	351	349	48	1,0 L	1	1,39		0		H	H	H	X		M	63	X	X		
1.5	A	1	1	18:21:55	348	350	351	349	53	9,1 L	283	1,51		0		H	H	H	X		M	74	X	X		
1.5	A	5	1	18:27:45	348	350	351	349	82	4,3 R	175	1,44		0		H	H	H	X		M	79	X	X		
1.5	A	6	1	18:41:25	348	350	351	349	34	3,5 L	3	1,39		0		H	H	H	X		M	61	X	X		
1.5	A	7	1	18:49:50	348	350	351	349	50	7,5 R	84	1,40		0		H	H	H	X		M	67	X	X		
1.5	A	4	2	18:59:30	352	350	351	349	70	2,4 L	273	1,47		40		V	V	V	X		M	[illegible]	X			
1.5	A	3	2	19:06:20	352	350	351	349	46	6,1 R	[illegible]	1,29		40		V	V	V	X		M	67	X			
1.5	A	2	2	19:14:20	352	350	351	353	39	1,3 L	5	1,39		40		V	V	V	X		M	65	X			
1.5	A	1	2	19:26:45	352	354	355	353	69	5,4 L	275	1,53		40		V	V	V	X		M	76	X			
1.5	A	5	2	19:34:40	352	354	355	353	67	6,0 R	177	1,34		40		V	V	V	X		M	76	X			
1.5	P	4	3	19:4[illegible]:25	352	354		353	[illegible]	4,[illegible] L	273	1,51	0		0 H				X	X	M	74	X			X
1.5	P	3	3	19:53:00	352	354		353	4[illegible]	7,9 R	83	[illegible]	0		0 H				X	X	M	67	X			X
1.5	P	2	3	20:00:14	352	354		353	41	[illegible] L	4	1,40	0		0 H				X	X	M	[illegible]	X			X
1.5	P	1	3	20:06:50	352	354		353	[illegible]	[illegible]	5	1,57	0		0 H				X	X	M	76	X			X
1.5	P	5	3	[illegible]	352	354		353	66	4 R	[illegible]	[illegible]	0		0 H				X	X	M	76	X			X
1.5	P	6	3	20:19:35	352	354		353		[illegible] L	1	1,54	0		0 H				X	X	M	65	X			X
1.5	P	7	3	[illegible]	[illegible]	354		353	[illegible]	[illegible],4 R	81	1,30	0		0 H				X	X	M	67	X			X
1	P	4	4	20:46:45	356	358		353	67	3,7 L	[illegible]	,39	40		40 H				X	X	M	80	X			X
1	P	3	4	20:53:30	356	358		352	46	5,[illegible] R	[illegible]	,44	40		40 H				X	X	M	[illegible]	X			X
1	P	2	4	[illegible]	356	[illegible]		352	34	3,[illegible] L	[illegible]	[illegible]	40		40 H				X	X	M	80	X			X
1	P	1	4	[illegible]	356	[illegible]		353	[illegible]	[illegible] L	[illegible]	[illegible]	[illegible]		40 H				X	X	M	[illegible]	X			X
1	P	[illegible]	4	[illegible]	356	[illegible]			71	4,[illegible] R	[illegible]	[illegible]	[illegible]		40 H				X	X	M	[illegible]	X			X
1	P	4	5	[illegible]	356	[illegible]		[illegible]	69	4,[illegible] L	[illegible]	[illegible]	4[illegible]		40 V				X	X	M		X			X
1	P	[illegible]	5	[illegible]:50	356	[illegible]		[illegible]	50	4,1 R	[illegible]	[illegible]	[illegible]		40 V				X	X	M	[illegible]	X			X
1	P	2	5	[illegible]:40:[illegible]	356	[illegible]		[illegible]	4[illegible]	[illegible],4 L		[illegible]	[illegible]		40 V				X	X	M	[illegible]	X			X
1	P	1	5	21:46:[illegible]	356	[illegible]		[illegible]	5[illegible]	0,7 L	[illegible]	[illegible]	[illegible]		40 V				X	X	M	80	X			X
1	P	[illegible]	5	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible],4 R	[illegible]	[illegible]	[illegible]		40 V				X	X	M	[illegible]	X			X

E-7

TABLE 2.– Continued.

(b) Data flight 5 – July 20 (Julian day 201).

Alt.	A/P	L	R	GMT	Tape recorder A	B	C	D	GS	DR	TH	RA	XR	CR	LR	PS	LS	CS	KS	PMIS	PRT	MMS	Z	AMPS	H	KZ
1	P	4	4	16:05:40	359	360		362	63	4,7 L	276	.85	40°		40° H				X	X	M	80	X			
1	P	3	4	16:12:10	359	360		362	43	3,8 L	95	.93	40°		40° H				X	X	M	80	X			
1	P	7	4	16:19:30	359	360		362	47	5,2 L	7	1.00	40°		40° H				X	X	M	80	X			
1	P	1	4	16:25:00	359	360		362	58	1,2 L	269	1,09	40°		40° H				X	X	M	80	X			
1	P	5	4	16:29:40	359	360		362	51	1,6 R	172	1,03	40°		40° H				X	X	M	80	X			
1	P	4	5	16:39:20	359	360		362	59	1,7 L	272	1,01	40°		40° V				X	X	M	80	X			
1	P	3	5	16:45:30	359	360		362	39	2,3 L	92	.94	40°		40° V				X	X	M	80	X			
1	P	7	5	16:51:50	359	360		362	55	5,8 L	16	1,09	40°		40° V				X	X	M	80	X			
1	P	1	5	16:57:10	359	360		362	71	0,5 L	269	1,14	40°		40° V				X	X	M	80	X			
1	P	5	5	17:01:59	359	360		362	45	4,4 R	169	1,04	40°		40°				X	X	M	70	X			
1.5	P	4	3	17:13:55	359	360		363	68	0	269	1,37	0°		0° H				X	X	M	76	X			
1.5	P	3	3	17:20:56	359	360		363	37	3,7 L	92	1,23	0°		0° H				X	X	M	61	X			
1.5	P	7	3	17:28:10	359	360		363	52	3,6 L	5	1,39	0°		0° H				X	X	M	61	X			
1.5	P	1	3	17:35:00	359	360		363	64	2,6 R	267	1,48	0°		0° H				X	X	M	74	X			
1.5	P	1	7	17:47:45	364	365		363	62	1,0 R	267	1,50	0°		0° H				X	X	M	[illegible]	X			
1.5	P	5	3	17:53:20	364	365		363	45	3,5 R	177	1,39	0°		0° H				X	X	M	65	X			
1.5	P	6	2	17:59:15	364	365		363	51	3,8 L	4	1,32	0°		0° H				X	X	M	65	X			
1.5	P	2	2	18:12:55	364	365		363	40	3,3 L	92	1,33	0°		0° H				X	X	M	63	X			
1.5	A	4	1	18:22:10		A B O R T E D																				
1.5	A	4	1	18:25:54	364	365	361	363	55	5,4 R	267	1,50		0°		H	H	H	X		M	72	X	X		
1.5	A	3	1	18:32:20	364	365	361	363	34	3,4 L	92	1,25		0°		H	H	H	X		M	61	X	X		
1.5	A	7	1	18:44:15	364	365	361	363	53	7,7 L	18	1,39		0°		H	H	H	X		M	67	X	X		
1.5	A	1	1	18:57:25	364	365	361	366	61	2,5 R	267	1,49		0°		H	H	H	X		M	72	X	X		
1.5	A	5	1	19:03:50	364	365	361	366	54	3,5 R	177	1,59		0°		H	H	H	X		M	70	X	X		
1.5	A	6	1	19:16:40	364	365	361	366	66	0,8 L	0	1,49		0°		H	H	H	X		M	72	X	X		
1.5	A	2	1	19:25:15	364	365	361	366	60	0,8 R	94	1,40		0°		H	H	H	X		M	70	X	X		
1.5	A	4	2	19:32:45	364	365	361	366	67	3,9 R	265	1,55		40°		V	V	V	X		M	74	X			
1.5	A	3	2	19:38:35	364	365	361	366	53	3,6 L	95	1,48		40°		V	V	V	X		M	70	X			
1.5	A	7	2	19:44:25	364	365	361	366	59	4,2 L	5	1,41		40°		V	V	V	X		M	70	X			
1.5	A	1	2	19:52:15	36[illegible]	367	361	366	68	5,1 R	266	1,42		40°		V	V	V	X		M	76	X			
1.5	A	5	2	19:57:50	364	367	361	366	54	3,6 R	175	1,55		40°		V	V	V	X		M	70	X			
1.5	A	7	7	20:05:35	368	367	361	366	77	1,9 L	0	1,49		40°		V	V	V	X		M	76	X			
1.5	A	5	7	20:11:50	368	367	361	366	40	4,0 R	175	1,48		40°		V	V	V	X		M	66	X			
8	A	3	6	20:27:40	368			369	82	5,3 L	90	8,03								X	M	13	X			
8	A	7	6	20:36:49	368			369	79	6,3 R	344	7,85								X	M	15	X			
8	A	1	6	20:45:10	368			369	57	4,9 R	259	8,06								X	M	13	X			
8	A	5	6	20:52:25	368			369	59	5,7 L	180	7,96								X	M	13	X			
8	A	6	3	20:58:35	368			369	96	2,2 R	4	7,80								X	M	15	X			
8	A	2	3	21:06:50	368			369	92	3,0 L	107	7,81								X	M	16	X			

TABLE 2.– Continued.

(c) Data flight 6/12 – July 21 (Julian day 202).

Alt.	A/P	L	R	GMT	Tape recorder				GS	DH	TH	HA	KR	CR	LR	PS	LS	CS	KS	PMIS	PRT	MMS	Z	AMPS	H	KZ
					A	B	C	D																		
1,5	A	4	1	15:55:00	370	371	372	373	52	8,2 L	263	1,49		0		H	H	H	X		M	67	X			
1,5	A	3	1	16:03:00	370	371	372	373	50	3,0 L	93	1,33		0		H	H	H	X		M	67	X			
1,5	A	7	1	16:10:50	370	371	372	373	62	5,7 R	356	1,49		0		H	H	H	X		M	69	X			
1,5	A	1	1	16:17:55	370	371	372	373	52	7,0 R	259	1,59		0		H	H	H	X		M	69	X			
1,5	A	5	1	16:24:50	370	371	372	373	51	2,9 L	181	1,50		0		H	H	H	X		M	67	X			
1,5	A	6	1	16:30:45	370	371	372	373	54	4,3 R	355	1,39		0		H	H	H	X		M	67	X			
1,5	A	2	1	16:39:35	370	371	372	373	48	2,4 L	94	1,43		0		H	H	H	X		M	67	X			
1,5	A	4	2	16:46:15	370	371	372	373	45	7,7 R	258	1,54		40		V	V	V	X		M	67	X			
1,5	A	3	2	16:54:35	370	371	372	373	52	3,1 L	93	1,35		40		V	V	V	X		M	67	X			
1,5	A	7	2	17:02:10	370	371	372	373	56	6,4 R	354	1,29		40		V	V	V	X		M	67	X			
1,5	A	1	2	17:09:20	370	371	372	373	48	8,6 R	263	1,54		40		V	V	V	X		M	67	X			
1,5	A	5	2	17:16:35	370	371	372	374	48	1,6 R	180	1,48		40		V	V	V	X		M	67	X			
1,5	P	4	3	17:29:45	370	371		374	49	8,4 R	263	1,44	0°		0° H				X	X	M	67	X			
1,5	P	3	3	17:45:05	376	375		374	46	2,3 L	95	1,49	0°		0° H				X	X	M	67	X			
1,5	P	7	3	17:53:15	376	375		374	47	3,3 R	356	1,43	0°		0° H				X	X	M	67	X			
1,5	P	1	3	18:01:00	376	375		374	53	4,2 R	266	1,53	0°		0° H				X	X	M	67	X			
1,5	P	5	3	18:09:15	376	375		374	49	1,1 L	179	1,48	0°		0° H				X	X	M	67	X			
1,5	P	6	2	18:15:35	376	375		374	49	1,9 R	01	1,39	0°		0° H				X	X	M	67	X			
1,5	P	2	2	18:25:00	376	375		374	50	1,7 L	89	1,50	0°		0° H				X	X	M	67	X			
1	P	4	4	18:31:50	376	375		374	42	2,4 R	270	,97	40°		40° H				X	X	M	80	X			
1	P	3	4	18:39:35	376	375		374	50	2,6 R	85	,94	40°		40 H				X	X	M	80	X			
1	P	7	4	18:47:00	376	375		374	52	0,5 R	354	,95	40°		40 H				X	X	M	80	X			
1	P	1	4	18:54:00	376	375		377	51	1,1 R	272	1,01	40°		40 H				X	X	M	80	X			
1	P	5	4	19:00:05	376	376		377	57	1,1 L	184	,96	40°		40 H				X	X	–	80	X			
1	P	4	5	19:08:45	376	375		377	46	1,7 L	272	1,00	40°		40 V				X	X	M	80	X			
1	P	3	5	19:22:55	376	378		377	51	5,2 R	85	,97	40°		40 V				X	X	M	80	X			
1	P	7	5[a]	19:29:50	376	378		377	47	0	01	,99	40°		40 V				X	X	M	80	X			
1	P	1	5	19:39:15	379	378		377	49	3,4 L	277	,92	40°		40 V				X	X	M	60	X			
1	P	5	5	19:45:20	379	378		377	53	2,2 R	179	,97	40°		40 V				X	X	M	80	X			
1	P	7	7	19:51:45	379	378		377	41	0	359	1,04	40°		40 V				X	X	M	80	X			
8	A	1	6[b]	20:04:05	379			377	69	9,3 R	256	7,89								X	M	28	X	X		
8	A	3	6	20:15:45	379			377	91	8,1 L	101	7,92								X	M	32	X	X		
Yuma, Colo.		2	1	20:52:04	379			377	31	7,3 R	83	,42									M	80	X	X		
		3	1	20:55:20	379			377	32	6,6 R	85	,40									M	80	X	X		
		1	1	20:58:30	379			377	39	0	84	,41									M	80	X	X		
		1	2	21:02:10	379			377	37	3,2 R	90	,41									M	80	X	X		

[a]"A" recorder off, rerun as line 7-7.
[b]PRT-5 and TAT late.

TABLE 2.– Continued.

(d) Data flight 7 – July 22 (Julian day 203).

Alt.	A/P	L	R	GMT	Tape recorder A	Tape recorder B	Tape recorder C	Tape recorder D	GS	DR	TH	RA	KR	CR	LR	PS	LS	CS	KS	PMIS	PRT	MMS	Z	AMPS	H	KZ
1	P	4	4	16:01:55	380	381			48	7.1 L	277	1.00	40°		40° H				X	X*	M	-	X			
1	P	4	7	16:18:15	380	381		383	48	6.1 L	276	1.13	40°		40 H				X	X	M	80	X			
1	P	3	4	16:32:10	380	381		383	54	7.2 R	79	1.00	40°		40 H				X	X	M	80	X			
1	P	7	4	16:40:10	380	381		383	46	2.7 R	359	1.07	40°		40 H				X	X	M	80	X			
1	P	1	4	16:46:45	380	381		383	41	6.7 L	276	1.11	40°		40 H				X	X	M	80	X			
1	P	5	4	16:54:50	380	381		383	59	3.3 L	186	.93	40°		40 H				X	X	M	80	X			
1	P	4	5	17:03:25	380	381		383	49	6.6 L	277	1.06	40°		40 V				X	X	M	80	X			
1	P	2	5	17:11:40	380	381		383	52	[illegible].8	82	.88	40°		40 V				X	X	M	80	X			
1	P	7	5	17:19:10	380	381		383	40	1.2 R	357	1.07	40°		40 V				X	X	M	80	X			
1	P	1	5	17:27:00	380	381		384	50	7.7 L	270	1.11	40°		40 V				X	X	M	80	X			
1	P	5	5	17:33:30	380	381		384	55	4.2 L	186	.93	40°		40° V				X	X	M	80	X			
1.5	P	4	3	17:42:15	380	381		384	44	5.9 L	280	1.54	0°		0° H				X	X	M	67	X			
1.5	P	3	3	17:50:50	380	381		384	54	7.0 R	82	1.46	0°		0 H				X	X	M	67	X			
1.5	P	7	3	18:02:00	385	386		384	42	5.0 R	354	1.57	0°		0 H				X	X	M	67	X			
1.5	P	1	3	18:09:10	385	386		384	53	6.9 L	276	1.5	0°		0 H				X	X	M	67	X			
1.5	P	5	3	18:15:35	385	386		384	60	2.4 L	185	1.45	0°		0 H				X	X	M	70	X			
1.5	P	6	2	18:21:55	385	386		384	38	3.4 R	355	1.5	0°		0 H				X	X	M	70	X			
1.5	P	2	2	18:31:00	385	386		384	45	7.7 R	81	1.48	0°		0° H				X	X	M	67	X			
1.5	A	4	1	18:40:35	385	386	382	384	51	6.3 L	280	1.50		0°		H	H	H	X		M	67	X			
1.5	A	3	1	18:47:55	385	386	382	387	51	5.0 R	84	1.39		0°		H	H	H	X		M	67	X			
1.5	A	7	1	18:55:25	385	386	382	387	41	1.2 R	360	1.54		0°		H	H	H	X		M	67	X			
1.5	A	1	1	19:07:20	385	386	382	387	53	6.1 L	276	1.58		0°		H	H	H	X		M	67	X			
1.5	A	5	1	19:08:30	385	386	382	387	60	0.6 L	181	1.50		0°		H	H	H	X		M	67	X			
1.5	A	6	1	19:15:00	385	386	382	387	48	0.7 R	358	1.66		0°		H	H	H	X		M	67	X			
1.5	A	2	1	19:23:30	385	386	382	387	52	6.9 R	85	1.52		0°		H	H	H	X		M	67	X			
1.5	A	4	2	19:33:00	385	386	382	387	50	9.4 L	278	1.57		40°		V	V	V	X		M	67	X	X		
1.5	A	3	2	19:40:35	385	386	382	387	54	7.0 R	85	1.45		40°		V	V	V	X		M	67	X	X		
1.5	A	7	2	19:52:55	388	389	382	387	47	1.5 L	5	1.49		40°		V	V	V	X		M	67	X	X		
1.5	A	1	2	19:59:50	388	389	382	387	50	4.7 L	276	1.50		40°		V	V	V	X		M	67	X	X		
1.5	A	5	2	20:06:30	388	389	382	387	52	2.2 R	180	1.47		40°		V	V	V	X		M	60	X	X		

*PMIS not noted on Instrument Summary Inflight Log.

TABLE 2.– Continued.

(e) Data flight 8 – August 8 (Julian day 220).

Alt.	A/P	L	R	GMT	Tape recorder A	B	C	D	GS	DH	TH	RA	HR	CR	LR	PS	LS	CS	KS	PMIS	PRT	PMS	Z	AMPS	N	NZ
8	A	3	6	18:11:15	415			418	60	3.4 R	87	[illegible]								X	M	14	X	X	X	
8	A	7	6	18:19:10	415			418	65	5.1 L	358	8.07								X	M	15	X	X	X	
8	A	1	6	18:27:15	415			418	89	2.2 L	269	7.96								X	M	15	X	X	X	
8	A	5	6	18:34:15	415			418	82	2.8 R	176	7.87								X	M	15	X	X	X	
8	A	6	3	18:39:45	415			418	60	4.9 L	8	8.15								X	M	15	X	X	X	
8	A	2	3	18:49:30	415			418	53	4.0 R	82	8.07								X	M	15	X	X	X	
1.5	P	4	3	19:01:40	415	416		418	51	5.0 R	269	1.54	0"		0" H				X	X	H	67			X	
1.5	P	3	3	19:09:40	415	416		418	50	1.7 L	95	1.35	0"		0" H				X	X	H	67			X	
1.5	P	7	3	19:17:20	415	416		418	44	3.0 L	6	1.39	0"		0" H				X	X	H	67			X	
1.5	P	1	3	19:25:20	415	416		418	53	3.2 R	270	1.40	0"		0" H				X	X	H	67			X	
1.5	P	5	3	19:31:50	415	416		418	54	2.9 R	179	1.60	0"		0" H				X	X	H	67			X	
1.5	P	6	2	19:38:15	415	416		418	47	3.2 L	4	1.42	0"		0" H				X	X	H	67			X	
1.5	P	2	2	19:52:50	419	420		418	47	0.9 L	92	1.54	0"		0" H				X	X	H	67			X	
1	P	4	4	20:00:50	419	420		418	54	3.6 R	269	1.01	40"		40" H				X	X	M	80			X	
1	P	3	4	20:09:00	419	420		422	49	1.4 L	92	1.05	40"		40" H				X	X	M	80			X	
1	P	7	4	20:15:40	419	420		422	48	5.9 L	9	.93	40"		40" H				X	X	M	80			X	
1	P	1	4	20:23:15	419	420		422	46	4.9 R	267	.99	40"		40" H				X	X	M	80			X	
1	P	5	4	20:31:15	419	420		422	50	3.4 R	177	1.09	40"		40"				X	X	M	80			X	
1	P	4	5	20:39:25	419	420		422	50	2.2 R	268	.96	40"		40" V				X	X	H	80			X	
1	P	3	5	20:46:35	419	420		422	53	3.1 L	95	1.00	40"		40" V				X	X	H	80			X	
1	P	7	5	20:53:25	419	420		422	50	5.3 L	6	.96	40"		40" V				X	X	H	80			X	
1	P	1	5	21:00:45	419	420		422	45	5.7 R	266	.99	40"		40" V				X	X	H	80			X	
1	P	5	5	21:06:40	419	420		422	51	2.4 R	180	1.00	40"		40" V				X	X	H	80			X	
1.5	A	4	1	21:19:15	421	423	417	424	49	3.0 R	267	1.48		0"		H	H	H	X		H	80			X	
1.5	A	3	1	21:27:20	421	423	417	424	41	0.6 R	91	1.49		0"		H	H	H	X		H	80			X	
1.5	A	7	1	21:34:10	421	423	417	424	58	3.7 L	10	1.46		0"		H	H	H	X		M	80			X	
1.5	A	1	1	21:41:55	421	423	417	424	53	4.9 R	264	1.48		0"		H	H	H	X		M	80			X	
1.5	A	5	1	21:48:30	421	423	417	424	47	2.8 R	178	1.58		0"		H	H	H	X		M	80			X	
1.5	A	6	1	21:54:25	421	423	417	424	47	6.2 L	4	1.57		0"		H	H	H	X		M	80			X	
1.5	A	2	1	22:04:05	421	423	417	424	56	0.1 L	93	1.51		0"		H	H	H	X		M	67			X	
1.5	A	4	2	22:13:30	421	423	417	424	54	1.7 R	268	1.48		40"		V	V	V	X		M	67			X	
1.5	A	3	2	22:21:00	421	423	417	424	51	0.9 R	90	1.49		40"		V	V	V	X		M	67			X	
1.5	A	7	2	22:29:05	421	423	417	425	49	5.5 L	4	1.43		40"		V	V	V	X		M	67			X	
1.5	A	1	2	22:36:15	421	423	417	425	47	4.2 R	265	1.48		40"		V	V	V	X		M	67			X	
1.5	A	5	2	22:41:55	421	423	417	425	56	4.8 R	178	1.47		40"		V	V	V	X		M	67			X	

TABLE 2.– Continued.

(f) Data flight 9/13 – August 9 (Julian day 221).

Alt.	A/P	L	R	GMT	Tape recorder A	B	C	D	GS	DR	TH	RA	KR	CR	LR	PS	LS	CS	KS	PMIS	PRT	MMS	Z	AMPS	H	KZ
1.5	A	4	1	15:45:00	426	427	428	429	41	1.2 R	266	1.30		0°		H	H	H	X		M	67			X	
1.5	A	3	1	15:52:05	426	427	428	429	53	2.7 L	94	1.45		0°		H	H	H	X		M	67			X	
1.5	A	7	1	15:59:10	426	427	428	429	65	0.3 L	7	1.46		0°		H	H	H	X		M	67			X	
1.5	A	1	1	16:05:50	426	427	428	429	56	0.7 R	271	1.53		0°		H	H	H	X		M	67			X	
1.5	A	5	1	16:13:35	426	427	428	429	51	0.8 R	177	1.48		0°		H	H	H	X		M	67			X	
1.5	A	6	1	16:19:40	425	427	428	429	53	0.9 R	351	1.45		0°		H	H	H	X		M	67			X	
1.5	A	2	1	16:28:45	426	427	428	429	51	0	90	1.43		0°		H	H	H	X		M	67			X	
1.5	A	4	2	16:35:45	426	427	428	429	49	2.3 R	265	1.49		40°		V	V	V	X		M	67			X	
1.5	A	3	2	16:43:20	425	427	428	429	48	0	91	1.49		40°		V	V	V	X		M	67			X	
1.5	A	7	2	16:50:45	426	427	428	429	57	0.4 L	6	1.40		40°		V	V	V	X		M	67			X	
1.5	A	1	2	16:58:25	426	427	428	430	50	2.8 R	270	1.57		40°		V	V	V	X		M	67			X	
1.5	A	5	2	17:05:15	426	427	428	430	56	2.4 R	180	1.49		40°		V	V	V	X		M	67			X	
1.5	P	4	3	17:21:50	431	427		430	49	1.3 L	267	1.48	0°		0° H				X	X	M	67			X	
1.5	P	3	3	17:33:45	431	432		430	49	3.4 L	91	1.5	0°		0° H				X	X	M	67			X	
1.5	P	7	3	17:41:55	431	432		430	52	2.0 L	3	1.47	0°		0° P				X	X	M	67			X	
1.5	P	1	3	17:49:05	431	432		430	50	2.0 R	268	1.56	0°		0° H				X	X	M	67			X	
1.5	P	5	3	17:57:05	431	432		430	44	1.7 R	179	1.49	0°		0° H				X	X	M	67			X	
1.5	P	6	2	18:03:05	431	432		430	49	1.5 L	3	1.49	0°		0° H				X	X	M	67			X	
1.5	P	2	2	18:12:30	431	432		430	43	3.0 L	94	1.47	0°		0° H				X	X	M	67			X	
1	P	4	4	18:19:50	431	432		430	49	2.1 R	268	1.06	40°		40° H				X	X	M	80			X	
1	P	3	4	18:29:10	431	432		433	52	1.5 L	93	.93	40°		40° H				X	X	M	80			X	
1	P	7	4	18:37:40	431	432		433	49	1.3 L	4	.94	40°		40° H				X	X	M	80			X	
1	P	1	4[1]	18:44:45	431	432		433	55	1.4 R	268	1.08	40°		40° H				X	X	M	80				
1	P	5	4[1]	18:51:40	431	432		433	52	1.5 R	179	.96	40°		40° H				X	X	M	80				
1	p	4	5	19:12:25	434	432		433	47	0.6 L	271	.96	40°		40° V				X	X	M	80	X			
1	P	3	5	19:20:30	434	432		433	47	0.4 L	90	1.05	40°		40° V				X	X	M	80	X			
1	P	7	5	19:32:45	434	435		433	49	2.8 L	1.2	1.14	40°		40° V				X	X	M	80	X			
1	P	1	5	19:39:55	434	435		433	52	4.5 R	269	1.01	40°		40° V				X	X	M	80	X			
1	P	5	5	19:51:05	434	435		436	48	3.0 R	180	1.0	40°		40° V				X	X	M	80	X			
7	A	3	6	20:05:40	434			436	66	2.2 L	93	7.2								X	M	30	X	X		
7	A	7	6	20:13:50	434			436	78	1.4 L	17	6.9								X	M	30	X	X		
7	A	1	6	20:20:45	434			436	79	0	270	7 0								X	M	30	X	X		
		2	1	20:49:20	434			436	40	2.9 L	93	.45									M	80	X	X		
Yuma, Colo.		1	1	20:53:35	434			436	33	1.8 L	90	.52									M	80	X	X		
		1	2	20:57:20	434			436	34	4.0 L	96	45									M	80	X	X		
		3	1	21:01:35	434			436	39	3.2 L	91	.45									M	80	X	X		

[1]No photographic coverage.

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TABLE 2.— Concluded.

(g) Data flight 10 — August 11 (Julian day 223).

Alt.	A/P	L	R	GMT	Tape recorder A	Tape recorder B	Tape recorder C	Tape recorder D	GS	DR	TH	RA	KR	CR	LR	PS	LS	CS	KS	PMIS	PRT	MMS	Z	AMPS	H	KZ
1	P	4	2[1]	09:15:35	437	438		440	55	7.6 R	263	1.03	40°		40° H				X	X	M	80				
1	P	3	2[1]	09:25:35	437	438		440	59	7.6 L	98	.94	40°		40° H				X	X	M	80				
1	P	7	2[1]	09:35:20	437	438		440	72	4.1 R	355	.93	40°		40° H				X	X	M	80				
1	P	1	2[1]	09:44:35	437	438		440	51	7.3 R	261	1.14	40°		40° H				X	X	M	80				
1	P	5	2[1]	09:53:35	437	438		440	51	3.6 L	177	1.04	40°		40° H				X	X	M	80				
1	P	4	3[1]	10:08:35	437	438		440	47	7.5 R	262	.99	40°		40° V				X	X	M	80				
1.5	P	4	1[1]	10:34:55	437	438		441	46	6.5 R	259	1.54	0°		0° H				X	X	M	67				
1.5	P	3	1[1]	10:43:20	437	438		441	63	4.2 L	91	1.44	0°		0° H				X	X	M	67				
1.5	P	7	1[1]	10:52:35	437	438		441	62	3.1 R	359	1.38	0°		0° H				X	X	M	74				
1.5	P	1	1[1]	11:00:40	437	438		441	59	2.8 R	260	1.58	0°		0° H				X	X	M	67				
1.5	P	5	1[1]	11:07:20	437	438		441	42	5.1 L	170	1.45	0°		0° H				X	X	M	67				
1.5	P	6	1[1]	11:16:55	442	443		441	63	2.6 R	358	1.50	0°		0° H				X	X	M	67				
1.5	P	2	1[1]	11:30:50	442	443		441	55	5.6 L	94	1.44	0°		0° H				X	X	M	67				
1.5	A	4	4	11:50:40	442	443	439	441	46	5.1 R	263	1.50		0°		H	H	H	X		M	67	X			
1.5	A	3	4	11:57:25	442	443	439	441	51	1.9 L	92	1.45		0°		H	H	H	X		M	67	X			
1.5	A	7	4	12:05:50	442	443	439	444	52	1.9 R	358	1.53		0°		H	H	H	X		M	67	X			
1.5	A	1	4	12:12:25	442	443	439	444	46	0	254	1.64		0°		H	H	H	X		M	67	X			
1.5	A	5	4	12:20:10	442	443	439	444	52	3.3 L	181	1.53		0°		H	H	H	X		M	67	X			
1.5	A	6	2	12:26:10	442	443	439	444	52	3.5 R	353	1.53		0°		H	H	H	X		M	67	X			
1.5	A	2	2	12:36:20	442	443	439	444	51	0	91	1.45		0°		H	H	H	X		M	67	X			
1.5	A	4	5	12:50:15	442	443	439	444	34	4.6 R	266	1.44		40°		V	V	V	X		M	67	X			
1.5	A	3	5	12:57:01	442	443	439	444	54	2.4 L	93	1.33		40°		V	V	V	X		M	67	X			
1.5	A	7	5	13:03:20	442	443	439	444	65	0	2	1.47		40°		V	V	V	X		M	67	X			
1.5	A	1	5	13:10:15	442	443	439	444	45	3.9 R	273	1.58		40°		V	V	V	X		M	63	X			
1.5	A	5	5	13:19:05	442	445	439	444	50	1.6 L	181	1.53		40°		V	V	V	X		M	67	X			

[1]No camera data — predawn passes.

Z = Zeiss camera (6-inch lens). X indicates "camera on."

AMPS = AMPS camera (six-camera system). X indicates "camera on."

H = Hasselblad camera. X indicates "camera on."

KZ = K-band zenith radiometer (MFMR). X indicates "Radiometer on."

The four data tape recorders referred to as A, B, C, and D were used in the following manner:[2]

Data flt. no.	Sensor			
	Recorder A (PMIS, PRT-5, all radiometers, NERDAS, TAT)	Recorder B (K-band and C-band scatterometer)	Recorder C (P-band and L-band scatterometer)	Recorder D (MMS)
4	348, 352, 356	350, 354, 358	351, 355	349, 353, 357
5	359, 364, 368	360, 365, 367	361	362, 363, 366, 369
6	370, 376, 379	371, 375, 378	372	373, 374, 377
7	380, 385, 388	381, 386, 389	382	383, 384, 387
8	415, 419, 421	416, 420, 423	417	418, 422, 424, 425
9	426, 431, 434	427, 432, 435	428	429, 430, 433, 436
10	437, 442	438, 443, 445	439	440, 441, 444

In addition to the data shown in table 2, a complete set of data from the NASA Earth Resources Data Annotation System (NERDAS) was available for all runs, and the outside temperature (called total air temperature in the flight log) was available for all runs except run 4 of flight line 5 of data flight 6.

Table 3 catalogs the film data taken. It is arranged in the same sequence as table 2 and gives magazine (roll) number and frame numbers for each run over each flight line. In addition, it gives both the start and stop times for each run.

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[2]The numbers in the following table are the last three digits of the raw data tape numbers. The prefix is L05-0-005.

TABLE 3.— SUMMARY SHEET SHOWING CAMERA FILM DATA BY DATA FLIGHT AND LINE-RUN FOR ASME — SUMMER 1978

Data flt. no.	Line-run	Line-run start-stop time, GMT (hr:min:sec)	Camera									Remarks
			Zeiss			AMPS			Hasselblad			
			Mag. (roll)	Frame	Film type	Mag.	Frame	Film type	Mag.	Frame	Film type	
4	3-6	17:00:45-17:04:40	3	1-17	CIR							High altitude
	7-6	17:08:25-17:12:00	3	18-32	CIR							
	1-6	17:16:28-17:19:55	3	33-46	CIR							
	5-6	17:23:30-17:27:05	3	47-60	CIR							
	6-3	17:29:20-17:33:10	3	61-75	CIR							
	2-3	17:38:20-17:41:10	3	76-87	CIR							
	4-1	17:57:20-18:01:05	3	88-125	CIR	4-9	1-114	B/W B/WIR				
	3-1	18:04:20-18:08:30	3	126-167	CIR	4-9	115-240					
	7-1	18:15:45-18:19:20	3	168-205	CIR	10-15	1-113					
	1-1	18:21:55-18:24:45	3	206-236	CIR	10-15	114-195					
	5-1	18:27:45-18:30:30	3	237-270	CIR	10-15	196-279					
	6-1	18:41:25-18:45:45	16	1-46	CIR	17-22	1-131					
	2-1	18:49:50-18:52:45	16	47-76	CIR	17-22	132-219					
	4-2	18:59:30-19:03:20	16	77-115	CIR							
	3-2	19:06:20-19:10:20	16	116-156	CIR							
	7-2	19:14:20-19:18:15	16	157-196	CIR							
	1-2	19:28:45-19:31:40	16	197-229	CIR							
	5-2	19:34:40-19:37:40	16	230-265	CIR							
	4-3	19:46:25-19:50:15	16	266-304	CIR							
	3-3	19:53:00-19:57:25	16	305-348	CIR							
	7-3	20:00:14-20:04:00	16	349-386	CIR							
	1-3	20:06:50-20:09:30	16	387-415	CIR							
	5-3	20:13:35-20:16:45	23	1-32	CIR							
	6-2	20:19:35-20:23:35	23	33-69	CIR							
	2-2	20:28:55-20:31:45	23	70-94	CIR							

TABLE 3.— Continued.

Data flt. no.	Line-run	Line-run start-stop time, GMT (hr:min:sec)	Camera									Remarks
			Zeiss			AMPS			Hasselblad			
			Mag. (roll)	Frame	Film type	Mag.	Frame	Film type	Mag.	Frame	Film type	
4	4-4	20:46:45-20:50:30	23	95-147	CIR							
	3-4	20:53:30-20:57:50	23	148-213	CIR							
	7-4	21:02:30-21:05:55	24	1-50	CIR							
	1-4	21:08:10-21:10:40	24	51-88	CIR							
	5-4	21:13:30-21:16:50	24	89-136	CIR							
	4-5	21:22:30-21:26:10	24	137-190	CIR							
	3-5	21:28:50-21:33:10	24	191-255	CIR							
	7-5	21:40:35-21:44:05	25	1-53	CIR							
	1-5	21:46:50-21:49:30	25	54-93	CIR							
	5-5	21:52:35-21:55:40	25	94-141	CIR							
5	4-4	16:05:40-16:09:20	26	1-56	CIR							
	3-4	16:12:10-16:16:25	26	57-121	CIR							
	7-4	16:19:30-16:22:45	26	122-171	CIR							
	1-4	16:25:00-16:27:35	26	172-210	CIR							
	5-4	16:29:40-16:33:00	26	211-261	CIR							
	4-5	16:39:20-16:42:45	27	1-52	CIR							
	3-5	16:45:30-16:49:40	27	53-116	CIR							
	7-5	16:51:50-16:55:00	27	117-164	CIR							
	1-5	16:57:10-16:59:50	27	165-205	CIR							
	5-5	17:01:59-17:05:20	27	206-256	CIR							
	4-3	17:13:55-17:17:30	28	1-36	CIR							
	3-3	17:20:55-17:25:05	28	37-78	CIR							
	7-3	17:28:10-17:31:25	28	79-111	CIR							
	1-3	17:35:00-17:37:50	28	112-141	CIR							
	1-7	17:47:45-17:50:35	28	142-170	CIR							
	5-3	17:53:20-17:57:10	28	171-209	CIR							
	6-2	17:59:15-18:03:00	28	210-247	CIR							
	2-2	18:12:55-18:16:05	29	3-34	CIR	(Frames 1 and 2 — No data)						

TABLE 3.– Continued

Data flt. no.	Line-run	Line-run start-stop time, GMT (hr:min:sec)	Camera									Remarks
			Zeiss			AMPS			Hasselblad			
			Mag. (roll)	Frame	Film type	Mag.	Frame	Film type	Mag.	Frame	Film type	
5	4-1	18:22:10-18:22:15	29	35-37	CIR	30-35	1-7	B/W & B/WIR	ABORTED			
	4-1	18:25:54-18:29:40	29	38-75	CIR	30-35	8-121					
	3-1	18:32:20-18:36:50	29	76-121	CIR	30-35	122-257					
	7-1	18:44:15-18:47:45	29	122-157	CIR	36-40 plus 47	1-107					
	1-1	18:57:25-19:00:20	29	158-187	CIR	"	108-195					
	5-1	19:03:50-19:07:20	29	188-223	CIR	"	196-301					
	6-1	19:16:40-19:20:10	29	224-259	CIR	41-46	1-103					
	2-1	19:25:15-19:28:10	48	1-29	CIR	41-46	104-191					
	4-2	19:32:45-19:36:20	48	30-66	CIR							
	3-2	19:38:35-19:42:35	48	67-107	CIR							
	7-2	19:44:25-19:47:40	48	108-140	CIR							
	1-2	19:52:15-19:55:10	48	141-170	CIR							
	5-2	19:57:50-20:01:29	48	171-211	CIR							
	7-7	20:05:35-20:09:00	48	212-245	CIR							
	5-7	20:11:50-20:15:30	49	1-37	CIR							
	3-6	20:27:40-20:31:55	49	38-55	CIR							
	7-6	20:36:49-20:40:20	49	56-70	CIR							
	1-6	20:45:10-20:48:50	49	71-84	CIR							
	5-6	20:52:25-20:56:45	49	85-100	CIR							
	6-3	20:58:35-21:02:05	49	101-115	CIR							
	2-3	21:06:50-21:09:50	49	116-129	CIR							
6	4-1	15:55:00-15:59:10	50	1-42	Color							
	3-1	16:03:00-16:07:10	50	43-84	Color							
	7-1	16:10:50-16:13:55	50	85-116	Color							

TABLE 3.– Continued.

Data flt. no.	Line-run	Line-run start-stop time, GMT (hr:min:sec)	Camera									Remarks
			Zeiss			AMPS			Hasselblad			
			Mag. (roll)	Frame	Film type	Mag.	Frame	Film type	Mag.	Frame	Film type	
6	1-1	16:17:55-16:20:50	50	117-145	Color							
	5-1	16:24:50-16:28:15	50	146-179	Color							
	6-1	16:30:45-16:34:25	50	180-216	Color							
	2-1	16:39:35-16:42:25	50	217-245	Color							
	4-2	16:46:15-16:50:15	51	1-41	Color							
	3-2	16:54:35-16:58:50	51	42-84	Color							
	7-2	17:02:10-17:05:20	51	85-116	Color							
	1-2	17:09:20-17:12:30	51	117-148	Color							
	5-2	17:16:35-17:20:05	51	149-183	Color							
	4-3	17:29:45-17:34:05	51	184-227	Color							
	3-3	17:45:05-17:49:15	52	4-45	Color							
	7-3	17:53:15-17:56:35	52	46-79	Color							
	1-3	18:01:00-18:03:55	52	80-109	Color							
	5-3	18:09:15-18:12:45	52	110-145	Color							
	6-2	18:15:35-18:19:20	52	146-183	Color							
	2-2	18:25:00-18:27:50	52	184-212	Color							
	4-4	18:31:50-18:36:05	52	213-275	Color							
	3-4	18:39:35-18:43:45	53	1-63	Color							
	7-4	18:47:00-18:50:30	53	64-111	Color							
	1-4	18:54:00-18:57:15	53	112-149	Color							
	5-4	19:00:05-19:03:35	53	150-191	Color							
	4-5	19:08:45-19:12:50	53	192-253	Color							
	3-5	19:22:55-19:27:10	54	1-64	Color							
	7-5	19:29:50-19:33:20	54	65-117	Color							
	1-5	19:39:15-19:42:25	54	118-165	Color							
	5-5	19:45:20-19:48:50	54	166-218	Color							
	7-7	19:51:45-19:53:25	54	219-244	Color							

TABLE 3.— Continued.

Data flt. no.	Line-run	Line-run start-stop time, GMT (hr:min:sec)	Camera									Remarks
			Zeiss			AMPS			Hasselblad			
			Mag. (roll)	Frame	Film type	Mag.	Frame	Film type	Mag.	Frame	Film type	
6	1-6	20:04:05-20:06:35	49	136-147	CIR	55-60	1-37	B/W & B/WIR				High altitude
	3-6	20:15:45-20:19:10	49	148-162	CIR	55-60	38-89					
12	2-1	20:52:04-20:52:32	49	168-175	CIR	55-60	97-111					Yuma, Colorado
	3-1	20:55:20-20:55:55	49	176-185	CIR	55-60	112-129					
	1-1	20:58:30-20:59:00	49	186-193	CIR	55-60	130-144					
	1-2	21:02:10-21:02:45	49	194-202	CIR	55-60	145-162					
7	4-4	16:01:55-16:06:05	No exposure - Camera doors not opened									
	4-7	16:18:15-16:22:35	61	64-119	Color							
	3-4	16:32:10-16:36:20	61	120-170	Color							
	7-4	16:40:10-16:43:50	61	171-215	Color							
	1-4	16:46:45-16:49:55	61	216-254	Color							
	5-4	16:54:50-16:58:05	62	1-48	B/W							
	4-5	17:03:25-17:07:40	62	49-113	B/W							
	3-5	17:11:40-17:15:40	62	114-174	B/W							
	7-5	17:19:10-17:23:10	62	175-224	B/W							
	1-5	17:27:00-17:30:15	62	225-264	B/W							
	5-5	17:33:30-17:36:50	62	265-314	B/W							
	4-3	17:42:15-17:46:40	62	315-353	B/W							
	3-3	17:50:50-17:55:05	62	354-390	B/W							
	7-3	18:02:00-18:05:45	62	391-422	B/W							
	1-3	18:09:10-18:12:15	62	423-453	B/W							
	5-3	18:15:35-18:18:55	62	454-482	B/W							
	6-2	18:21:55-18:25:55	62	483-518	B/W							
	2-2	18:31:00-18:34:05	62	519-545	B/W							
	4-1	18:40:35-18:44:55	63	1-38	B/W							
	3-1	18:47:55-18:52:10	63	39-80	B/W							

TABLE 3.— Continued.

Data flt. no.	Line-run	Line-run start-stop time, GMT (hr:min:sec)	Camera									Remarks
			Zeiss			AMPS			Hasselblad			
			Mag. (roll)	Frame	Film type	Mag.	Frame	Film type	Mag.	Frame	Film type	
7	7-1	18:55:25-18:59:15	63	81-110	B/W							
	1-1	19:02:20-19:05:20	63	111-134	B/W							
	5-1	19:08:30-19:11:50	63	135-166	B/W							
	6-1	19:15:00-19:18:45	63	167-196	B/W							
	2-1	19:23:30-19:26:30	63	197-222	B/W	55-60	166-255	B/W & B/WIR				
	4-2	19:33:00-19:37:10	63	223-254	B/W	64-69	1-127	↓				
	3-2	19:40:35-19:44:50	63	255-290	B/W	64-69	128-256					
	7-2	19:52:55-19:56:40	63	291-319	B/W	70-75	1-114					
	1-2	19:59:50-20:03:00	63	320-343	B/W	70-75	118-211					
	5-2	20:06:30-20:09:50	63	344-372	B/W	70-75	212-312					
8	3-6	18:11:15-18:15:55	91	1-19	CIR	92-97	1-36		98	1-4	CIR	
	7-6	18:19:10-18:23:30	91	20-36	CIR	92-97	37-66		98	5-13	CIR	
	1-6	18:27:15-18:30:19	91	37-50	CIR	92-97	67-89		98	14-20	CIR	
	5-6	18:34:15-18:37:34	91	51-65	CIR	92-97	90-115		98	21-28	CIR	
	6-3	18:39:45-18:44:00	91	66-82	CIR	92-97	116-146		98	29-37	CIR	
	2-3	18:49:30-18:53:10	91	83-96	CIR	92-97	147-172	↓	98	38-44	CIR	
	4-3	19:01:40-19:06:15							98	45-90	CIR	
	3-3	19:03:40-19:14:45							98	91-141	CIR	
	7-3	19:17:20-19:21:44							98	142-186	CIR	
	1-3	19:25:20-19:28:55							98	187-222	CIR	
	5-3	19:31:50-19:35:55							98	223-263	CIR	
	6-2	19:38:15-19:42:25							98	264-305	CIR	
	2-2	19:52:50-19:56:50							98	306-345	CIR	
	4-4	20:00:50-20:05:10							98	346-410	CIR	
	3-4	20:09:00-20:13:30							98	411-478	CIR	

TABLE 3.— Continued.

Data flt. no.	Line-run	Line-run start-stop time, GMT (hr:min:sec)	Camera: Zeiss Mag. (roll)	Zeiss Frame	Zeiss Film type	AMPS Mag.	AMPS Frame	AMPS Film type	Hasselblad Mag.	Hasselblad Frame	Hasselblad Film type	Remarks
8	7-4	20:15:40-20:19:30							98	479-536	CIR	
	1-4	20:23:15-20:26:45							98	537-589	CIR	
	5-4	20:31:15-20:34:55							99	1-55	CIR	
	4-5	20:39:25-20:44:00							99	56-123	CIR	
	3-5	20:46:35-20:51:10							99	124-192	CIR	
	7-5	20:53:25-20:57:10							99	193-249	CIR	
	1-5	21:00:45-21:04:00							99	250-298	CIR	
	5-5	21:06:40-21:10:20							99	299-354	CIR	
	4-1	21:19:15-21:23:20	91	97-157	CIR				99	355-416	CIR	
	3-1	21:27:20-21:31:40	91	158-199	CIR				99	417-458	CIR	
	7-1	21:34:10-21:37:50	91	200-231	CIR				99	459-490	CIR	
	1-1	21:41:55-21:45:00	100	1-27	B/W				99	491-517	CIR	
	5-1	21:48:30-21:52:00	100	28-56	B/W				99	518-546	CIR	
	6-1	21:54:25-21:58:05	100	57-93	B/W				99	547-583	CIR	
	2-1	22:04:05-22:07:30	100	94-128	B/W				101	1-48	CIR	
	4-2	22:13:30-22:17:30							101	49-88	CIR	
	3-2	22:21:00-22:25:15							101	89-131	CIR	
	7-2	22:29:05-22:32:50							101	132-169	CIR	
	1-2	22:36:15-22:39:15							101	170-200	CIR	
	5-2	22:41:55-22:45:20							101	201-235	CIR	
9	4-1	15:45:00-15:49:25							101	240-284	CIR	
	3-1	15:52:05-15:56:45							101	285-331	CIR	
	7-1	15:59:10-16:03:10							101	332-372	CIR	
	1-1	16:05:00-16:09:20							101	373-408	CIR	
	5-1	16:13:35-16:17:10							101	409-444	CIR	
	6-1	16:19:40-16:23:30							101	445-483	CIR	
	2-1	16:28:45-16:32:15							101	484-519	CIR	

TABLE 3.— Continued.

Data flt. no.	Line-run	Line-run start-stop time, GMT (hr:min:sec)	Camera									Remarks
			Zeiss			AMPS.			Hasselblad			
			Mag. (roll)	Frame	Film type	Mag.	Frame	Film type	Mag.	Frame	Film type	
9	4-2	16:35:45-16:40:00							101	520-562	CIR	
	3-2	16:43:20-16:47:55							101	563-608	CIR	
	7-2	16:50:45-16:54:35							101	609-645	CIR	
	1-2	16:58:25-17:01:50							102	1-35	CIR	
	5-2	17:05:15-17:08:55							102	36-72	CIR	
	4-3	17:21:50-17:26:05							102	73-115	CIR	
	3-3	17:33:45-17:38:25							102	116-162	CIR	
	7-3	17:41:55-17:45:40							102	163-198	CIR	
	1-3	17:49:05-17:52:45							102	199-235	CIR	
	5-3	17:57:05-18:00:50							102	236-273	CIR	
	6-2	18:03:05-18:06:50							102	274-308	CIR	
	2-2	18:12:30-18:16:05							102	309-344	CIR	
	4-4	18:19:50-18:24:15							102	345-411	CIR	
	3-4	18:29:10-18:33:25							102	412-475	CIR	
	7-4	18:37:40-18:41:20	Hasselblad malfunctioned						102	476-506	CIR	
	1-4	18:44:45-18:47:55			No camera data							
	5-4	18:51:40-18:55:25			No camera data							
	4-5	19:12:25-19:16:30	100	132-193	B/W	(exposed as CIR film)						
	3-5	19:20:30-19:25:15	100	194-265	B/W	(exposed as CIR film)						
	7-5	19:32:45-19:36:25	103	1-56	CIR							
	1-5	19:39:55-19:43:10	103	57-105	CIR							
	5-5	19:51:05-19:55:05	104	1-61*	CIR							
	3-6	20:05:40-20:10:15	104	78-96	CIR	92-97	173-208	B/W & B/WIR				
	7-6	20:13:50-20:17:25	104	97-112	CIR	92-97	212-238	"				
	1-6	20:20:45-20:23:45	104	113-125	CIR		239-261	"				

*Frames 62-77 "extra pictures."

TABLE 3.— Concluded.

Data flt. no.	Line-run	Line-run start-stop time, GMT (hr:min:sec)	Camera									Remarks
			Zeiss			AMPS			Hasselblad			
			Mag. (roll)	Frame	Film type	Mag.	Frame	Film type	Mag.	Frame	Film type	
13	2-1	20:49:20-20:50:10	104	127-139	CIR	92-97	262-287					Yuma, Colorado
	1-1	20:53:35-20:54:15	104	140-150	CIR	92-97	288-309					
	1-2	20:57:20-20:58:15	104	151-164	CIR	92-97	310-314	(AMPS camera ran out of film.)				
	3-1	21:01:35-21:02:20	104	165-177	CIR							
10	4-2	09:15:35-09:21:15	Pre-dawn passes									
	3-2	09:25:35-09:31:05										
	7-2	09:35:20-09:39:20										
	1-2	09:44:35-09:49:00										
	5-2	09:53:35-09:58:45										
	4-3	10:08:35-10:14:05										
	4-1	10:34:55-10:39:40										
	3-1	10:43:20-10:48:30										
	7-1	10:52:35-10:56:05										
	1-1	11:00:40-11:04:00										
	5-1	11:07:20-11:11:31										
	6-1	11:16:55-11:20:40										
	2-1	11:30:50-11:34:00										
	4-4	11:50:40-11:55:10	105	1-53	B/W	(First 7 frames no filter used)						
	3-4	11:57:25-12:01:40	105	54-96	B/W							
	7-4	12:05:50-12:09:30	105	97-133	B/W							
	1-4	12:12:25-12:15:40	105	134-166	B/W							
	5-4	12:20:10-12:24:00	105	167-205	B/W							
	6-2	12:26:10-12:30:00	105	206-244	B/W							
	2-2	12:36:20-12:39:25	106	1-32	B/W							
	4-5	12:50:15-12:54:35	106	33-82	B/W							
	3-5	12:57:01-13:01:19	106	83-126	B/W							
	7-5	13:03:20-13:07:05	106	127-164	B/W							
	1-5	13:10:15-13:13:25	106	165-196	B/W							
	5-5	13:19:05-13:22:47	106	197-234	B/W							

APPENDIX

AIRCRAFT SENSOR CONFIGURATION AND COMPATIBILITY

Figures A-1 and A-2 show the configuration of the various sensors on the NC-130 aircraft. Table A-1 shows the compatibility matrix for the sensors on the NC-130. No entry indicates that the sensors are compatible; i.e., there is no known reason why the two sensors should not be operated simultaneously. Mechanical incompatibility occurs when only one of the two sensors can be mounted in its operating position. However, in all cases, changeover in flight from one sensor to another can be accomplished with little difficulty. The one case of electromagnetic incompatibility observed was due to out-of-band emission of the 1.6-GHz scatterometer at the L-band radiometer frequency of 1.4 GHz. This effect is expected because of the radiometer's high sensitivity.

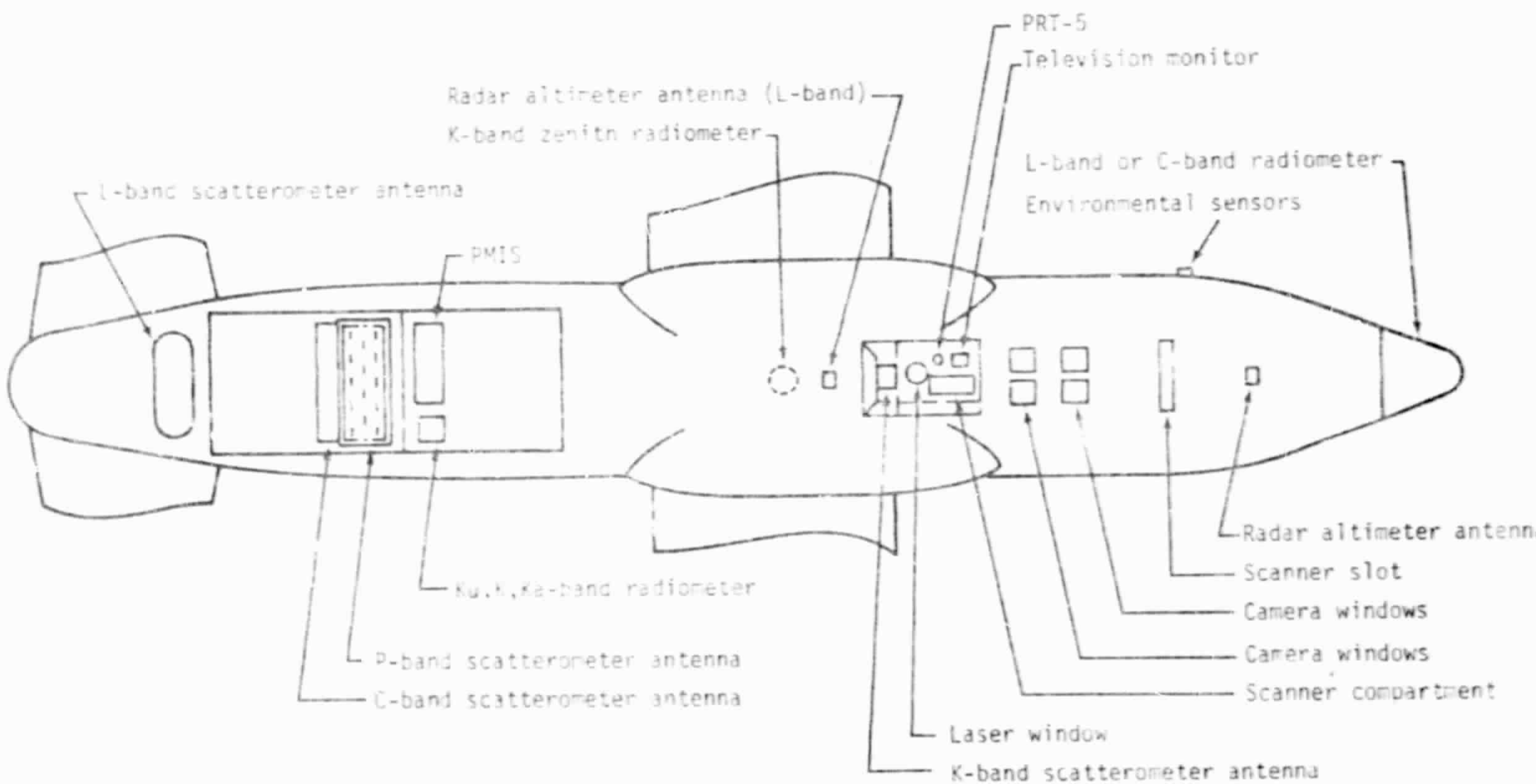

Figure A-1.– Bottom view of the NASA aircraft (NC-130).

~~E-15~~
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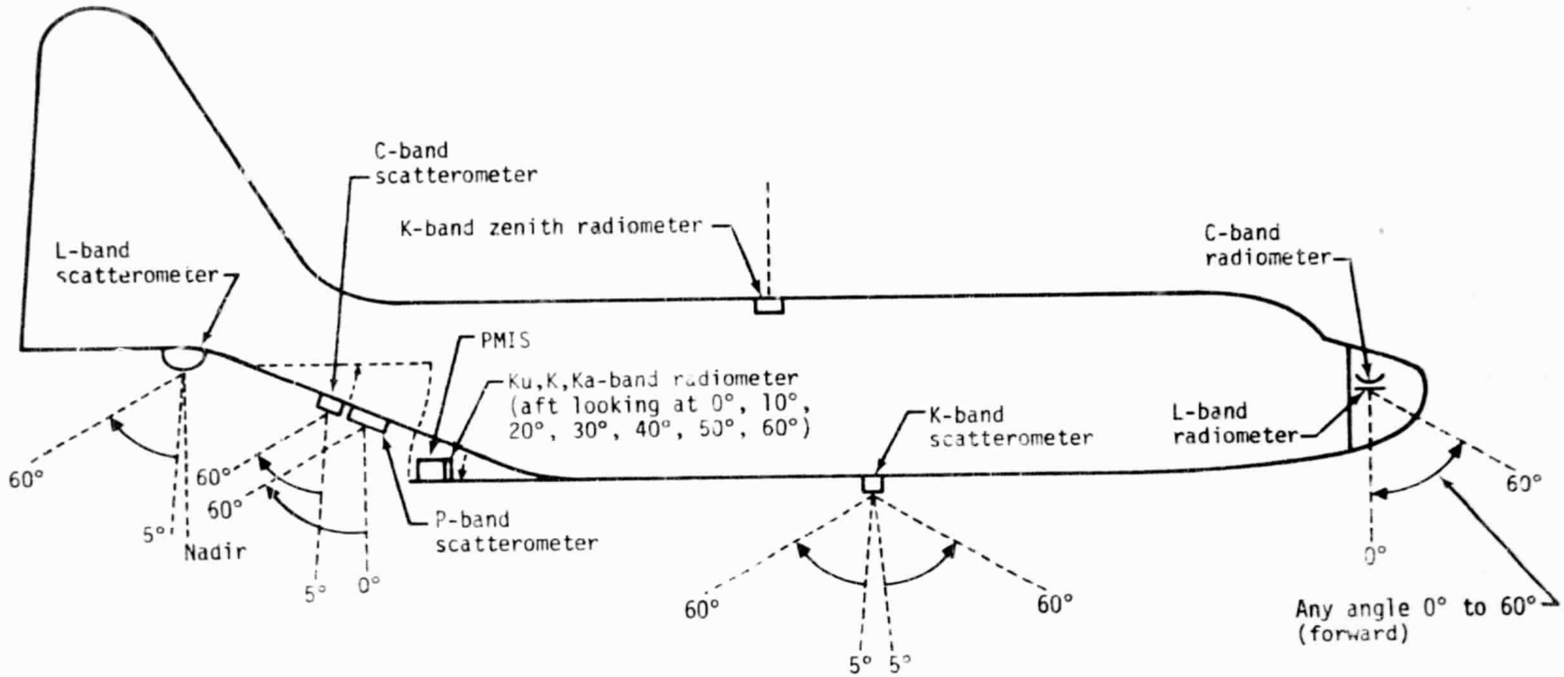


Figure A-2.— Side view of the NASA aircraft (NC-130).

TABLE A-1. NC-130 MICROWAVE SENSOR OPERATIONAL COMPATIBILITY MATRIX

[M = mechanical incompatibility; E = electromagnetic interference; no entry means that the instruments are compatible.]

Sensor	PMIS	Ku, K, Ka radiometers	L-band radiometer	C-band radiometer	Zenith K-band radiometer	0.4-GHz scatterometer	1.6-GHz scatterometer	4.75-GHz scatterometer	13.3-GHz scatterometer
PMIS						M	M	M	
Ku, K, Ka radiometers						M	M	M	
L-band radiometer				M			E		
C-band radiometer			M						
Zenith K-band radiometer									
0.4-GHz scatterometer	M	M							
1.6-GHz scatterometer	M	M	E						
4.75-GHz scatterometer	M	M							
4.75-GHz scatterometer									
13.3-GHz scatterometer									

APPENDIX F

SOIL SAMPLING PROCEDURE

AGRICULTURAL SOIL MOISTURE ESTIMATION PROJECT (ASME)

THOMAS COUNTY, KANSAS

SUMMER/FALL 1978

1. ORGANIZATION

The soil moisture and soil bulk density samples will be collected from 35 plots of 16.2 square hectometers (40 acres) each, within the Colby Test Area located in Thomas County, Kansas. The sample collection personnel will be divided into 17 five-man teams. Each team leader, who probably will be an employee of Lockheed Electronics Company, Inc., will direct the activities of two two-man squads in collecting samples from 2 of the 35 plots. The team leader will drive the team automobile or truck. He will ensure that proper sampling procedures are followed and that all required samples are obtained in a timely manner.

2. SOIL MOISTURE SAMPLING PROCEDURES

Each two-man squad will collect 148 soil moisture samples from one plot (field). These samples are to be collected over a 35-point grid which samples a 16.2-square-hectometer (40-acre) area. A diagram of the grid layout for a typical plot is given in figure 2-1. Each squad will have two inventory data sheets to complete *while sampling*. These data sheets are to be signed and included in the packing boxes with the soil moisture samples.

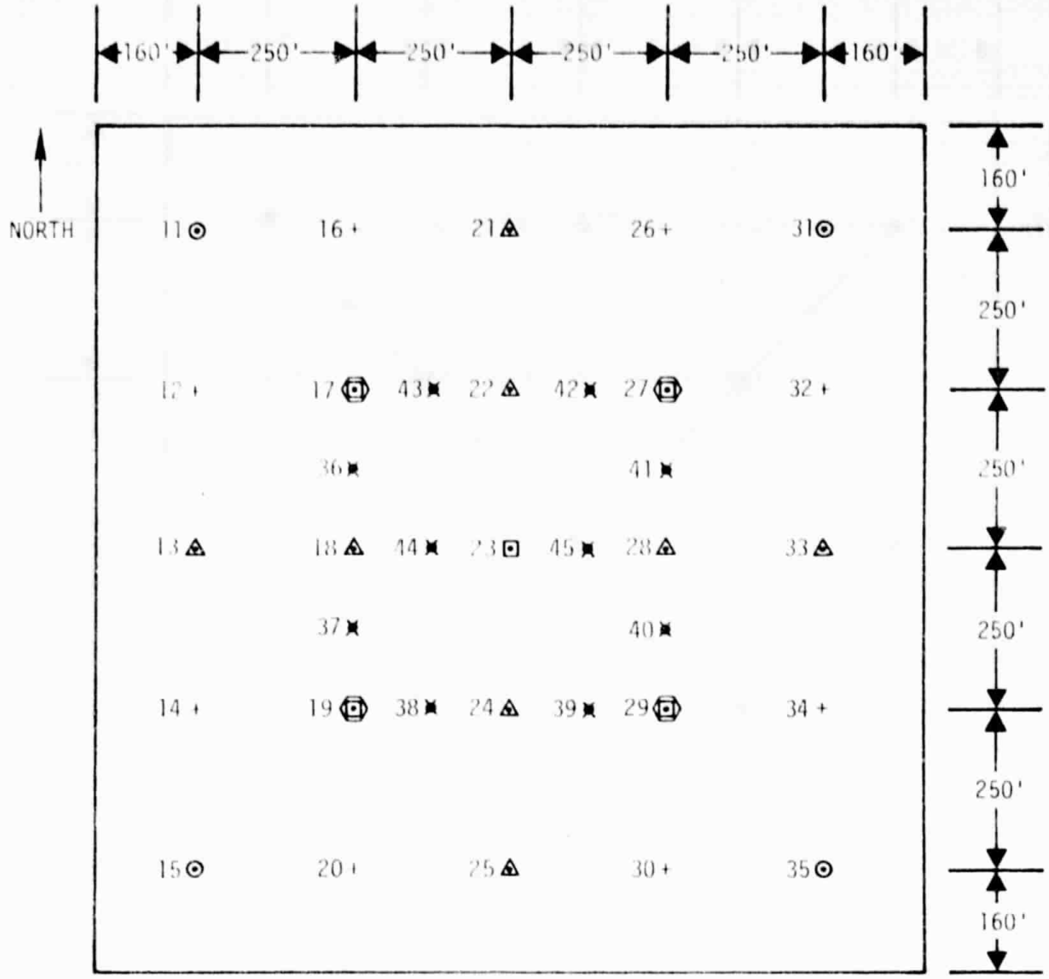
Two types of moisture samples will be taken: core samples covering 15-centimeter (6-inch) intervals to a depth of 45 centimeters (18 inches), and samples dug with a trowel to a depth of 15 centimeters (6 inches). The core samples will be collected several hours before or after an aircraft overpass. The samples to be dug, especially those for depths less than 5 centimeters (2 inches) must be taken within 4 ± 2 hours of an aircraft overflight. The team leader will determine the exact sampling schedule for each squad, depending on conditions at flight time.

2.1 CORE SAMPLING PROCEDURES

Core samples will represent soil moisture averaged over 15-centimeter (6-inch) depth intervals. Therefore, these samples may be obtained up to 12 hours prior to or after an overflight. A total of nine grid points will be used for the core sampling, as shown in figure 2-2.

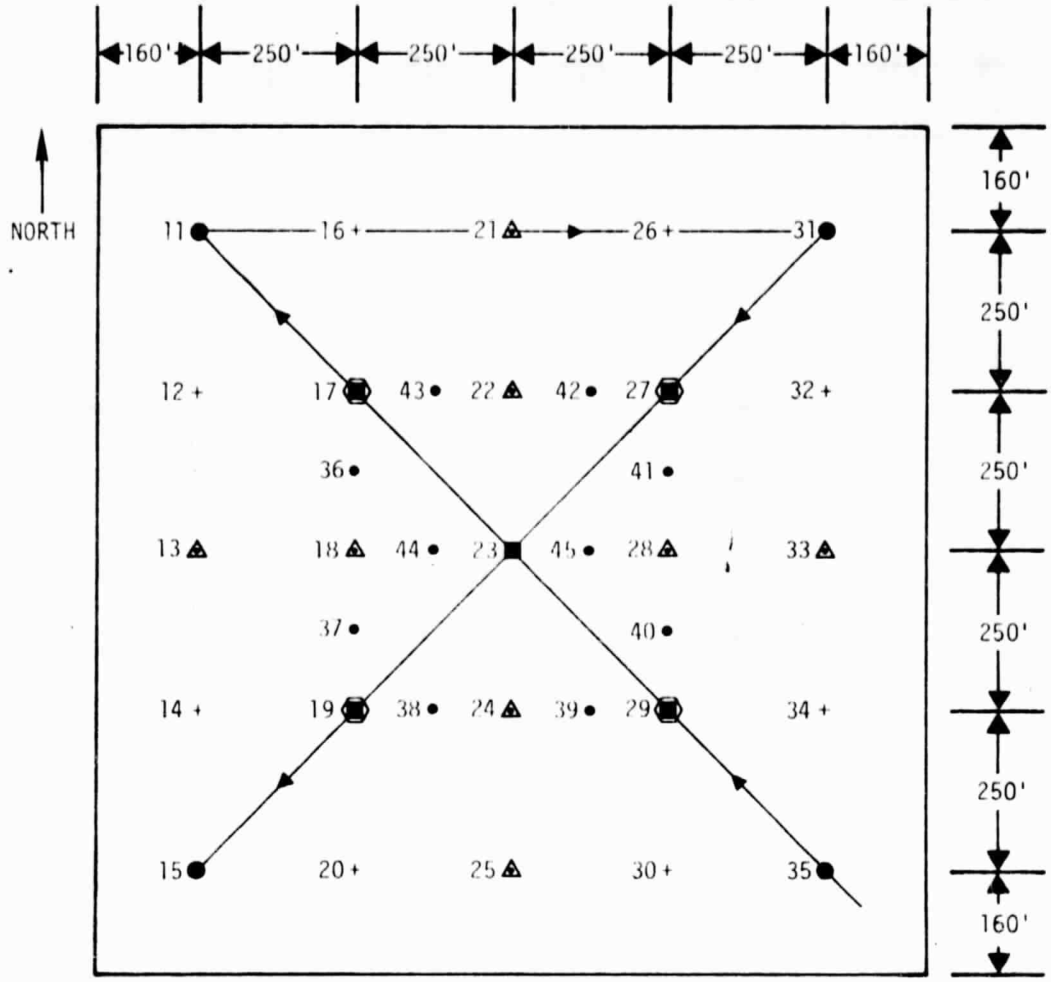
The sampling should be done by two persons, who may either work together or individually. Each grid point will be marked by a 4.7-centimeter (12- by 12-inch) tile or stake. All samples for a grid point should be taken within a 3-meter (10-foot) radius of the marker.

At each of the four extreme corners of the grid pattern, a core measuring from 0 to 15 centimeters (0 to 6 inches) will be taken. Five additional points arranged along the diagonals between the corner grid points will be



Symbol	Depth intervals, cm
✱	0-1, 1-2
+	0-1, 1-2, 2-5
◬	0-1, 1-2, 2-5, 5-9, 9-15
⊙	0-1, 1-2, 2-5, 5-9, 9-15 and 0-15 (core)
⊡	0-1, 1-2, 2-5, 5-9, 9-15 and 0-15, 15-30, 30-45 (core)
⬡	Bulk density samples

Figure 2-1. - Test point locations.



Symbol	Depth intervals, cm	No. of Locations	No. of Samples	Total
•	0-1, 1-2	10	2	20
+	0-1, 1-2, 2-5	8	3	24
▲	0-1, 1-2, 2-5, 5-9, 9-15	8	5	40
⊙	0-1, 1-2, 2-5, 5-9, 9-15, 0-15	4	6	24
⊡	0-1, 1-2, 2-5, 5-9, 9-15, 0-15, 15-30, 30-45	5	8	40
⬡	Bulk density samples	4	–	–
				148

Figure 2-2.– Test point locations for core samples.

the locations for obtaining three core samples: one from 0 to 15 centimeters (0 to 6 inches), one from 15 to 30 centimeters (6 to 12 inches), and one from 30 to 45 centimeters (12 to 18 inches) in depth.

The core tool should be pushed into the soil until the 15-centimeter (6-inch) mark on the core barrel is flush with the surface. If the soil is too compacted to allow the tool to be pushed in, a leather mallet may be used to drive the tool into the soil. The tool should be removed carefully and the entire core placed into a sample can. Each can must be properly labeled when the soil is added and the lid put on immediately and secured. Then, the can should be put into the cardboard packing box. The squad will then proceed to the next depth, using the same hole, (or to the next point in the field). Of course, all core samples should be obtained for a given grid point at one time.

The squad should begin at one corner of the field and proceed across it along the diagonal bisecting the field; then, samples should be taken along the other (perpendicular) diagonal. A total of 19 cans will be filled during this procedure. Before beginning to dig samples using trowels, the inventory list should be completed for the core samples. The box of samples and core tools should be set at the edge of the field or put into the team vehicle if it is available.

2.2 TROWEL SAMPLES

Using brickmason's trowels, 129 soil samples will be dug. There will be from one to five samples collected at each grid point in each field. Premarked cans will be used whenever possible. Squad members should work individually – each carrying a box of sample cans, a trowel, a ruler, a marker, and a checklist. A suggested walking pattern for this phase of the work is shown in figure 2-3. Note that *all* of these samples must be collected within 2 hours of the overflight.

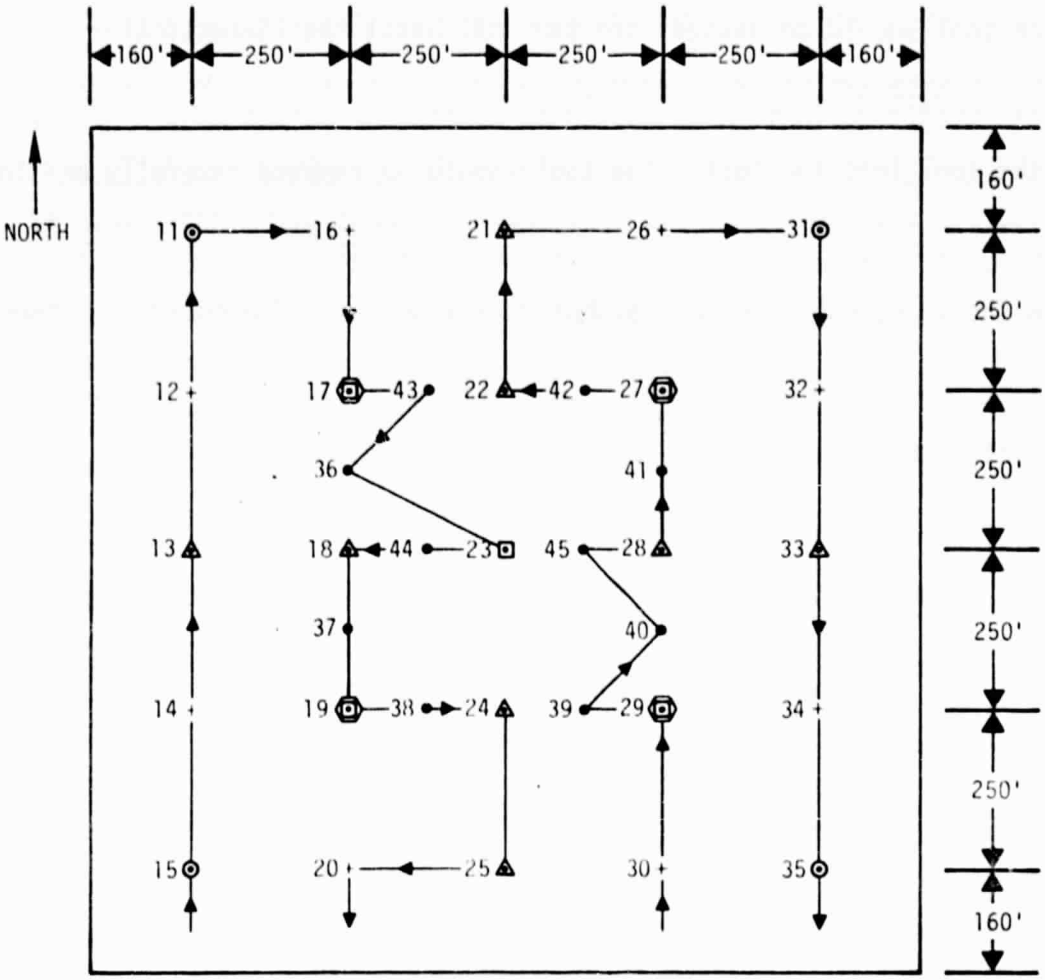


Figure 2-3.– Test point locations and walking pattern.

At a given point, a can must be prepared for the surface sample. The top centimeter (approximately ½ inch) of soil should be skimmed from the surface over a large enough area to fill the can from 80 to 90 percent, but not entirely full. If the can is not already marked, it should be marked now. A ruler should be used to estimate the depth sampled; then, the top should be put on the can immediately. This procedure will be repeated for the next centimeter of depth over the same area at intervals of 1 to 2 centimeters.

A small hole should now be dug with the trowel so that the ruler can be used to measure deeper and so that the trowel can scoop soil from the correct intervals: 2 to 5 centimeters, 5 to 9 centimeters, and 9 to 15 centimeters (figure 2-4). Each sample should be put into the properly marked can and the lid put on tightly immediately after the sample is exposed. Each can should be checked to make sure it is correctly marked. As figure 2-3 indicates, at one-half of the grid points, all five depth intervals are sampled; however, there are eight points where sampling below 5 centimeters is not required. Also, there are 10 points near the center of the field where only the two surface samples (0 to 1 and 1 to 2 centimeters) are collected.

When both squad members have completed collecting their samples they should meet at the edge of the field. All samples should then be neatly packaged in two boxes with the completed inventory sheets included in each box.

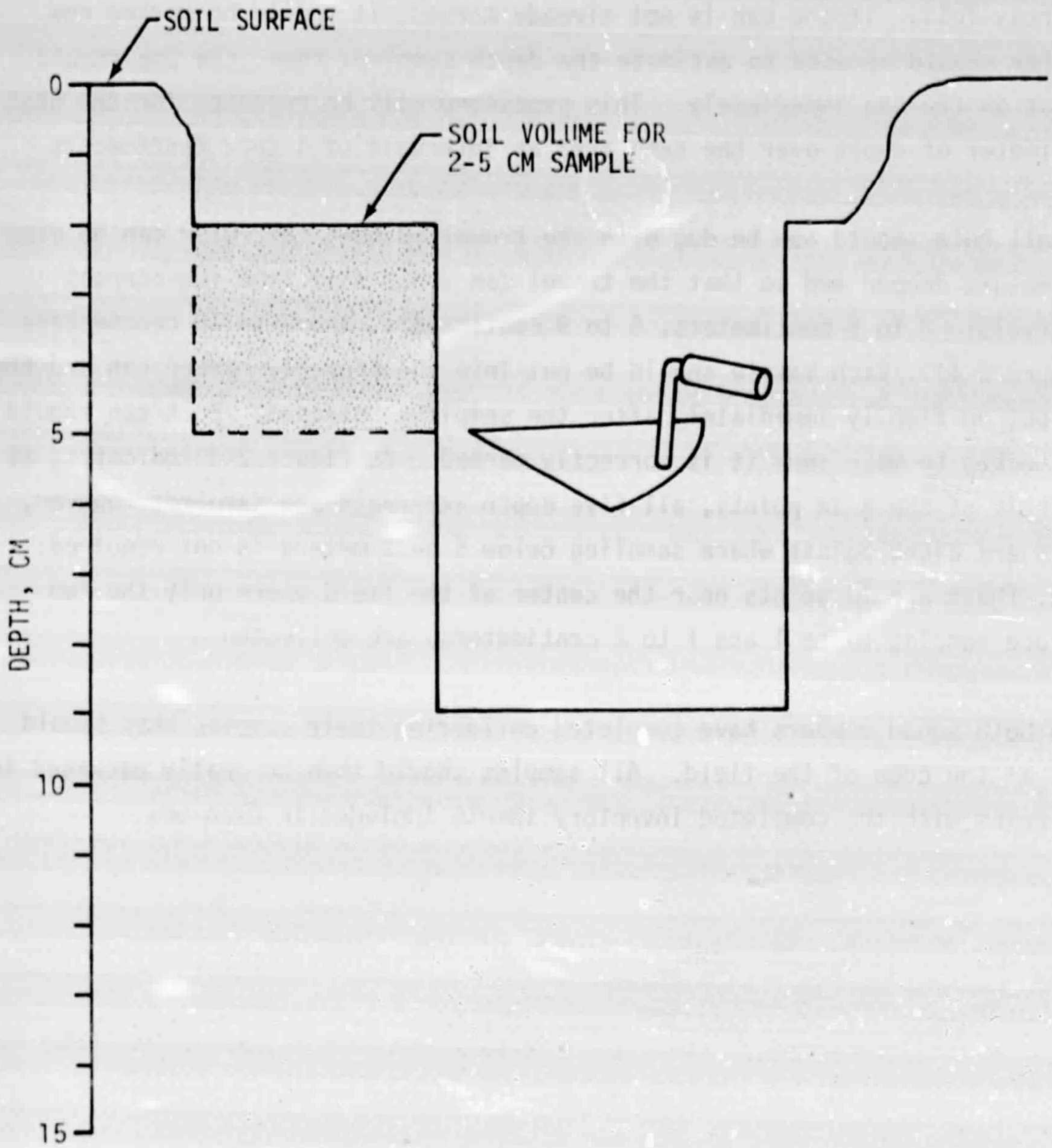


Figure 2-4.-- Schematic for digging soil samples.

APPENDIX G

MOISTURE LOSS FROM SAMPLE CONTAINERS USED FOR SOIL MEASUREMENTS

APPENDIX G

MOISTURE LOSS FROM SAMPLE CONTAINERS USED FOR SOIL MEASUREMENTS

1. INTRODUCTION

Determining the soil moisture content of soil samples from test sites is part of the Agricultural Soil Moisture Experiment (ASME) sponsored by the Earth Observations Division (EOD) at the Lyndon B. Johnson Space Center (JSC). Ground-truth data are gathered to test remote sensors and provide data for modeling the signal return with soil moisture.

During the summer of 1978, numerous soil samples were taken from a test site near Colby, Kansas, and stored in cans until the samples could be processed for soil moisture content. Since the accuracy of the soil moisture determination would be adversely affected if there were significant losses of moisture from these cans before they were processed, tests were performed at the site to estimate this loss. The results indicated that the moisture loss was tolerable. To verify these conclusions, the laboratory test described in this report were conducted. In addition to tests on the cans used at Colby, containers used for the same purpose on other missions were tested for comparison.

2. TREATMENT OF SAMPLES TAKEN FROM COLBY, KANSAS

The samples taken at Colby consisted of approximately 100 grams of soil placed in cans with lids. Because the lids did not give a hermetic seal, they were taped to the can body around the edges to reduce loss of moisture. The cans were transported to McCook, Nebraska, and were weighed. The interval between the time of sampling and the time of weighing was 1 to 2 days. A step-by-step procedure for soil sample handling is given in appendix G-1.

At McCook, Nebraska, each can was heated with the lid off in order to remove all moisture. Then the can, the dry soil, and the lid were weighed together. The difference in the two weight measurements (the weight before and after heating) was taken as the weight of the moisture in the original sample.

Next, only the empty can and the lid were weighed. The percentage of moisture content in the soil was calculated using these data.

3. ESTIMATION OF MOISTURE LOSS FROM THE CANS USED AT COLBY

The loss of moisture from the cans was probably caused by two effects:

a. Daytime heating of the gas inside the can, causing increased pressure and forcing some of the gas out through seams in the can.

b. Diffusion of water vapor through seams in the can.

Because the resources were not available to simulate the heating and cooling cycles experienced by the samples taken at Colby, the first effect was estimated mathematically. The calculations are described in the appendix.

The diffusion of water vapor through seams in the cans was estimated using the tests described below. The cans used were selected from the same batch used at Colby. All of the tests except test 4 were performed at JSC.

- Test 1 (taped cans, Texas soil). The soil used in this test was a local sandy loam similar to the Keith silt loam at the Colby test site, except that the local soil contained somewhat more clay. Approximately 100 grams of moist soil was placed in each of 10 cans, and the cans were taped around the edges of the lid using the same masking tape used at Colby. Each can was then weighed using a Mettler Instrument Corporation analytical balance and weighed again each day for 5 days at approximately the same time. The average daily weight loss is given in table 1. It was assumed that all weight losses were due to moisture losses. The consistency of the balance was checked by weighing a test weight (approximately 78 grams) each day. The maximum variation observed in the test weight was 0.02 gram. Throughout this test, the cans were kept in an air-conditioned room at a temperature of approximately 72° F.

- Test 2 (taped cans, water). To obtain an upper limit on water loss, pure water was substituted for the soil sample. The water was poured into a smaller container that was placed inside the can. Pure water would ensure

TABLE 1.— MEASURED AVERAGE DAILY MOISTURE LOSSES IN GRAMS

Sample	Test 1: taped cans, Texas soil	Test 2: taped cans, water	Test 3: untaped cans, water	Test 4: taped cans, Colby soil (a)	Test 5: type 1 cups, soil	Test 6: type 1 cups, water	Test 7: type 2 cups, soil
1	0.076	0.094	0.18	0.07	0.36	0.18	0.88
2	.078	.096	.17	.12	.32	.18	.96
3	.066	.084	.18	.08	.31	.18	.87
4	.078	.086	.16	.08	.30	.15	.94
5	.056	.068	.16	.08	.35	.19	.88
6	.058	.082	.17	.07	.34	.17	.93
7	.066	.082	.17	.10	.42	.20	.90
8	.070	.084	.16	.10	.30	.18	.99
9	.062	.086	[b].16	.08	.41	.20	.93
10	.062	.098	[c].20	.08	.46	.18	.87
11		.086		.08			
12		.092		.10			
13		.070		.10			
14		.096		.08			
15		.090		.10			
16				.08			
17				.07			
18				.10			
19				.10			
20				.08			
Average	0.067	0.086	0.17	0.088	0.36	0.18	0.92
SD	0.008	0.009	0.013	.013	0.056	0.014	0.041

[a]Test 4 by Agricultural Technology, Inc.

[b]Lid slightly loose.

[c]Lid on part way.

the maximum water vapor partial pressure in the cans, and therefore, the greatest moisture loss. The smaller container had a diameter of 6.7 centimeters and therefore was large enough to ensure an equilibrium vapor pressure inside the can (diameter 8.5 centimeters). Otherwise, the test was carried out in the same way as test 1, except that 15 cans were used instead of 10.

- Test 3 (untaped cans, water). This test was the same as test 2, except that the cans were not taped and only 10 cans were used. It was designed to investigate the effect of taping the lid to the can.

- Test 4 (taped cans, Colby soil). This test was performed by Agricultural Technology, Inc., using soil from the Colby test site. This test was to determine whether the exact soil type was important and to provide an independent set of measurements to serve as a check on the tests conducted at JSC. It was conducted in a manner similar to test 1, except that 20 cans were used. They were initially weighed on September 27, 1978, and were subsequently weighed on September 28 and 29, 1978, and on October 3, 1978. The results given in table 1 are the average daily weight losses over the 6-day period.

4. ESTIMATION OF MOISTURE LOSS FROM PAPER CUPS

Moisture loss from two types of paper cups used to collect soil moisture samples in previous missions was studied.

"Type 1" cups were used by the University of Arkansas to hold soil samples taken at Garden City, Kansas, in 1976. These cups were of the coronet design made by the Solo Cup Company of Chicago, Illinois. They have a seam down the side and around the bottom.

"Type 2" cups were used by Texas A&M University for holding soil samples taken at several sites since 1975. They appear to be identical to the type 1 cups except they have a paper glued to the side of the cup.

The following tests were performed on these cups.

- Test 5 (type 1 cups, soil). This test was carried out in a manner similar to test 1. The cups were sealed by placing Baggies over the cup before the lids were pressed down, which is the procedure that was employed when these cups were used in the field.
- Test 6 (type 1 cups, water). This test was similar to test 2, except for the containers used. The cups were sealed in the same manner as in test 5.
- Test 7 (type 2 cups, soil). This test was the same as test 5, except for the difference in containers.

5. RESULTS AND CONCLUSIONS

The results are shown in table 1. All tests used 10 containers, except test 2, which used 15 containers and test 4, which used 20 containers.

Test 2 (taped cans, water), which sould give an upper bound for moisture loss from taped cans, showed an average loss of approximately 29 percent more moisture than test 1 (taped cans, Texas soil). This loss was probably due to the lack of soil moisture in test 1 to maintain a saturated water vapor pressure in the can.

Test 3 showed that in the saturated case, the loss from untaped cans was twice the loss from taped cans (test 2). Even though the resulting loss was small, it showed that taping the cans significantly reduced the loss of soil moisture.

Test 4 showed that the Colby soil in taped cans had about the same moisture loss as the pure water in taped cans (test 2). This probably indicates that the soil was wet enough to maintain a saturated vapor pressure. This test also gave a moisture loss similar to that obtained using Texas soil (test 1).

Of the taped cans tested (tests 1, 2, and 4), the worst case for losing significant amounts of moisture was test 4, which had a slightly smaller mean

moisture loss than test 2 but had a larger variance. Assuming that the moisture losses estimated in test 4 were normally distributed, one would expect the moisture loss to be less than 0.12 gram per day in 95 percent of such measurements. Since the time between taking and weighing the samples was 1 to 2 days, the maximum moisture loss would be about 0.24 gram.

Most of the samples were estimated to contain 10 grams or more of water. An error of 0.24 gram (2.4 percent or less) is small compared to the within-field variability of the soil moisture measurements, which typically had a coefficient of variation of 15 percent or more. However, some of the samples were estimated to have less than 10 grams of water. The lowest estimates were 1 gram of water. An error of 0.24 gram is a sizable percentage of this amount but is still acceptable because

- the coefficient of variation for the within-field variance of these dry samples was typically 30 percent or more; and
- regardless of the error, the absolute value of the soil moisture determination is very small compared to the range of soil moisture measured.

It should also be kept in mind that the experiments were conducted in relatively wet soils; thus, the figure of 0.24 gram is probably much higher than the actual water lost from these dry samples.

Test 6 showed that the type 1 cups with water had about the same moisture loss as the untaped cans with water (test 3). Test 5 showed that the type 1 cups with soil had a moisture loss that was approximately twice that of tests 3 and 6. A possible explanation is that the cups were slightly porous; and because the soil was in contact with the cup, capillary action resulted in a substantial loss of moisture. In any case, the type 1 cups with soil lost more than four times more moisture than the taped cans. However, when these cups were used, the first weighing occurred within a half day; thus, the moisture loss was probably in the neighborhood of 0.17 gram.

Test 7 showed that the type 2 cups with soil had a much larger moisture loss than that shown by any of the other tests — 0.92 gram per day on the average.

It is estimated that when these cups were used, the maximum time between taking a sample and the first weighing was 8 hours. Therefore, the estimated maximum moisture loss is 0.31 gram.

For the same reasons given above for the taped cans, it is concluded that the moisture loss from the type 1 and type 2 cups was acceptable. However, it should be noted that the taped cans lost much less moisture than either type of cup and therefore appear to be much superior containers for soil moisture samples.

The above conclusions are based on the assumption that moisture loss in the field was similar to the moisture loss in these tests. This assumption may be an approximation because of differences in temperature, humidity, and air circulation.

APPENDIX G-1

STEP-BY-STEP PROCEDURE FOR HANDLING AND PROCESSING OF SOIL MOISTURE SAMPLES

The step-by-step procedure for soil sample handling is as follows:

1. Number can for identification.
2. Acquire soil sample by appropriate method and place in can.
3. Place lid on can.
4. Wrap can/lid jointly with masking tape and crimp in place.
5. Collect and box cans from individual fields and transport to weigh station.
6. At initial weighing, remove tape and weigh can, lid, and soil sample. (Residual tape adhesion was demonstrated to be considerably less than 0.05 gram.)
7. Place can and lid in oven and dry soil sample.
8. Remove dry sample and weigh can, lid, and soil sample.
9. Remove soil sample and weigh can and lid.
10. Compute gravimetric soil moisture as follows:

$$S.M._{g(\%)} = \left\{ \frac{[(\text{weight from 6}) - (\text{weight from 9})]}{(\text{weight from 8} - \text{weight from 9})} - 1 \right\} \times 100$$

$$= \left(\frac{\text{wet weight} - \text{dry weight}}{\text{dry weight}} \right) \times 100$$

APPENDIX G-2

MOISTURE LOSS DUE TO DIURNAL TEMPERATURE CHANGES

Because the cans used at Colby were not airtight, moisture could be lost during heating portion of the day when the pressure inside the can increased, forcing air out of the can. In order to maximize estimated moisture loss, it will be assumed that the leaks in the can were large enough to relieve any increased pressure on the inside; i.e., that the inside pressure is atmospheric and that the water vapor pressure inside the can is at the saturated level.

When the can is heated, the pressure inside will be increased because of the expansion of the air due to an increase in temperature and because of an increase in the saturated water vapor pressure.

Assume a peak daytime temperature of 100° F or 311.8 K and a minimum night temperature of 60° F or 288.8 K. The corresponding saturated water vapor pressures are 49.2 and 13.3 millimeters of mercury. At the minimum temperature, the gas law PV = nRT gives

$$N_1 - V_1(760 - P_1)/T_1R \qquad \text{(A-1)}$$

and

$$n_1 = V_1P_1/T_1R, \qquad \text{(A-2)}$$

where the subscript 1 refers to the value of quantities at the minimum temperature and

N_1 = number of moles of dry air,

n_1 = number of moles of water vapor,

V_1 = the volume of gas in the can,

p_1 = 13.3 millimeters (the partial pressure of water vapor in the can, saturated value), and

T_1 = 288.8 K.

Assume that as the can is heated, an isobaric expansion to volume V_2 occurs. At the final temperature T_2 (311.8 K), the gas law gives

$$N_2 = N_1 = V_2(760 - p_2)/T_2R \qquad \text{(A-3)}$$

and

$$n_2 = V_2p_2/T_2R, \qquad \text{(A-4)}$$

where the subscript 2 refers to the values of quantities at temperature T_2. Note that the number of moles of air has not changed, but that the number of moles of water vapor has changed.

An upper limit on the moisture loss can be obtained by assuming that a volume $V_2 - V_1$ of the gas in the final state (i.e., at temperature T_2) is lost. The amount (in moles) of water vapor in this volume is given by the following.

$$n = n_2 (V_2 - V_1)/V_2 \qquad \text{(A-5)}$$

From equations (A-1) through (A-4), the following equation is derived.

$$n = p_2V_1 \left[(760 - p_1)/T_1(760 - p_2) - 1/T_2\right]/R \qquad \text{(A-6)}$$

Taking V_1 equals to the volume of the can (0.473 liter), one obtains $n - 1.58 \times 10^{-4}$ moles. Multiplying by the molecular weight of 18, one obtains a water loss of 2.8×10^{-3} grams per day. This is negligible compared to the diffusion losses shown in table 1.